Journal

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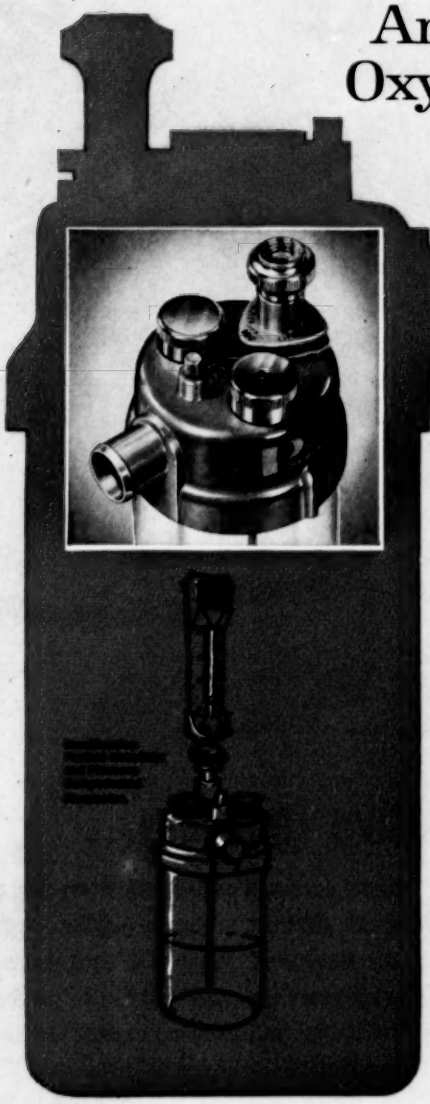

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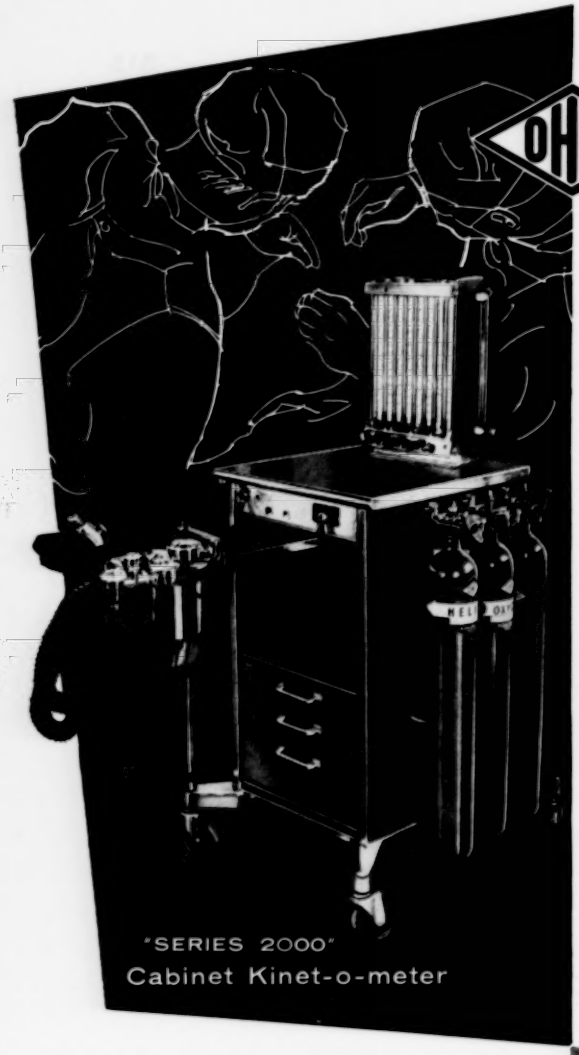

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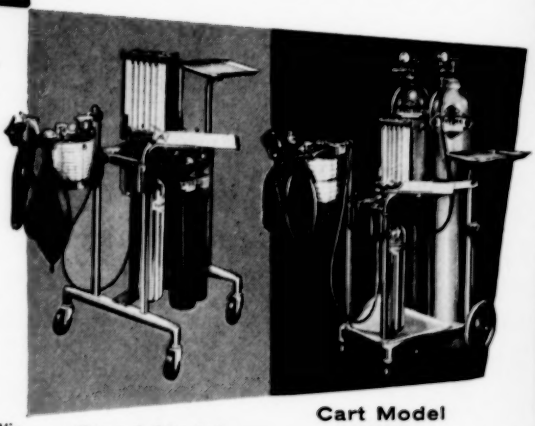

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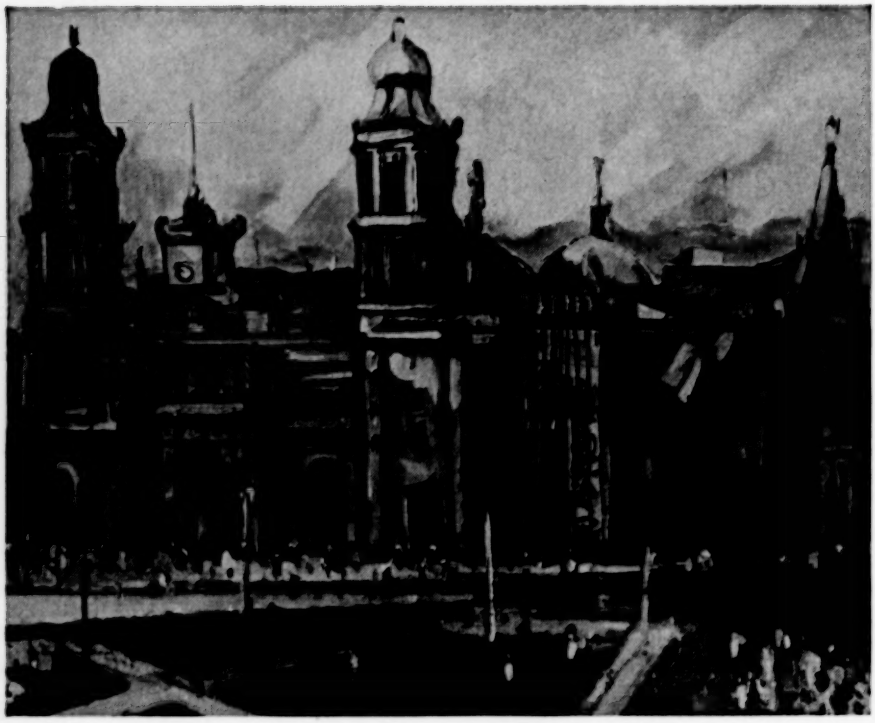

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Anesthesia for Thoracic Surgery

E. George Beer, M.D.*
Oakland, California

In reviewing the field of thoracic surgery and anesthesia I shall limit myself as much as possible to my own personal experience and that of my associates.

This automatically imposes further limitations on our discussion due to the preselection of our veteran patients. We deal predominantly with middle-aged men from forty to eighty years of age, with an occasional Korean War veteran in the third decade of life. Our operations are predominantly for tumors of the intrathoracic organs, for the repair of diaphragmatic hiatal hernias, about one-third for pulmonary tuberculosis, fungus infection, bronchiectasis and lung abscess. We hardly ever deal with congenital disorders of the heart and of the great vessels and do not have any personal experience or need for cardiopulmonary bypass or pump oxygenator. Ten years ago we had a fair number of mitral commissurotomies and a few aortic stenoses that were done blindly; now the emphasis has shifted to extrathoracic vascular surgery for vascular occlusion and aneurysms. We rarely see emergency surgery for chest injuries that is so common in the general hospital.

* Chief, Anesthesiology Section, Veterans Administration Hospital, Oakland.

Presented at the annual meeting, American Association of Nurse Anesthetists, San Francisco, August 29, 1960.

Preoperative Evaluation and Preparation

With these limitations in mind, let us discuss the preoperative evaluation and preparation of our patients. As I pointed out, most of them are in the older age groups. Their pulmonary and cardiovascular reserves are reduced, and we have to decide in advance whether these people will tolerate the contemplated surgery. In the presence of a malignant lesion we are obviously willing to accept a greater risk but, in any case, we want the patient to be in the best possible condition that can be attained preoperatively.

A blood volume and hemoglobin level adequate to insure full oxygenation is even more important in preparation for a chest operation than it is in general surgery. Preoperative transfusions have many advantages over hurried blood replacement during surgery. They reduce the risk of incompatible blood, allowing for early detection of the signs of a hemolytic reaction, which are entirely subjective and which are completely masked under anesthesia. They allow for a slow rate of blood flow, thereby materially reducing the danger of overloading the right heart, which is particularly important in patients with a heart damaged by arteriosclerosis, hypertension or pulmonary fibrosis and emphysema.

We realize that any disease of the cardiovascular system increases the risk of surgery, but we feel that the over all clinical picture, the absence of dyspnea on mild exertion or at rest and of dependent edema are more important for the successful management than hyper- or hypotension of long standing or certain disturbances of the rhythm. A recent myocardial infarct, on the other hand, contraindicates elective surgery and only life saving procedures should be undertaken and limited to just this one purpose. Patients in cardiac failure should be adequately treated with digitalis, diuretics and sodium restriction until they are in the best possible condition.

Some of you may remember the days about 20 years ago when excess bronchial secretions constituted one of the major problems in thoracic surgery. Positioning a patient with bronchiectasis, especially turning him on his side, could lead to flooding of the opposite lung with severe, prolonged and sometimes fatal hypoxia. Prolonged postural drainage and scheduling chest surgery for the afternoon were the only means then available to reduce this risk. The antibiotics and defoaming detergents that have since become available have greatly changed the picture and increased the safety of intrathoracic surgery. Other means to prevent spillage into the opposite lung will be discussed later on.

In general surgery we attempt to estimate the patient's preoperative condition so that we may estimate his ability to withstand the stress of surgery and anesthesia. In chest surgery this evaluation is made more difficult by the presence of an open pneumothorax during surgery and the reduction of ventilating alveoli postoperatively by a closed pneumothorax over an unexpanded lung or by removal of varying degrees of pulmonary tissue. An individual, otherwise healthy, can adjust himself to these conditions. Patients with pulmonary emphysema, pulmonary fibrosis or cardiovascular impairment, on the other hand, lack the necessary reserves, and it is with regard to these patients that exact methods for evaluation are most desirable. Climbing several flights of stairs without shortness of breath may be an adequate test in a young and robust person. Fluoroscopy of the chest is a valuable method. It permits observation of the movement of the diaphragm and the ribs and a fair estimate of the degree of air trapping. These rather crude methods are, as just pointed out, inadequate for patients with advanced bilateral impairment, or in patients where surgery is contemplated on a lung that has carried most of the ventilatory and respiratory function. It is in these patients that a pulmonary physiology laboratory can give invaluable aid. Timed vital capacity and other air speed determinations, measurement of residual air and arterial oxygen saturation at rest and after exercise, as well as bronchospirometric studies of each separate lung, will help us determine with reasonable assurance which borderline patients might be subjected to surgery and anesthesia.

An increasing number of patients that come to surgery these days have been under drug effects for prolonged periods of time. I mention Rauwolfia preparations for hypertensive heart disease, meprobamate or phenothiazine derivatives for anxiety or outright psychoses, cortisone for a variety of conditions like asthma and

diseases of the so-called collagen group, and the newer oral drugs that replace insulin partially or completely. This last group is easy to manage, provided we know about the drugs. We do not worry about temporary hyperglycemia during surgery, and our effort is directed towards the avoidance of acidosis and hypoglycemia. More serious problems are posed by cortisone and its cogeners; unless we can increase the maintenance doses to about 100 mg. a day for at least 48 hours prior to surgery, we might be faced with hypotension during and after operation that will not respond to any treatment. That same complication has been described in patients who were not taken off some of the other drugs mentioned. Although of no direct concern to the conduct of anesthesia, it might be pointed out here that patients with pulmonary or extra-pulmonary tuberculosis should be protected by appropriate levels of Streptomycin, Isoniazid or related drugs against reactivation or spread of their disease.

So much about the long range preparation of the patient. Now to the preoperative medication. Its purpose, as has been pointed out so often, is to allay fears, reduce reflex irritability, dry up secretions in the tracheo-bronchial tree and reduce the amount of anesthetic agents administered. Over the years, numerous drugs have been advertised that are supposedly capable of accomplishing all this without undue depression or any other side effects. A great number of articles have been published that prove the superiority of a certain drug, articles that in their majority only reflect a subjective impression of the author based on an inadequate number of observations in studies that neglected all known safeguards against biased selections. Only in the last few years have adequate studies been published, mostly based on random selection and double blind technique, where neither the patient nor the observer knew the identity of the drugs administered. I feel that at this time no particular drug has proved so vastly superior or safer that its use could be recommended to the exclusion of all other drugs. On the other hand, most of us who handle only a limited number of patients would do well to use only a few drugs and become familiar with them.

Now to the individual drugs. There is rather general agreement that either atropine or scopolamine have their definite uses in reducing secretions and, to a certain degree, counteract the depressing effects of narcotics upon the respiratory center. To obtain best effects, the drugs should be given 60 to 90 minutes preoperatively subcutaneously, or 10 minutes preoperatively if the intravenous route is used. Otherwise, all we do is convert thin secretions that are easily aspirated into thick, tenacious mucus that is most difficult to remove. In patients with a history of true bronchial asthma, atropine in larger than usual doses might block the vagus fibers and prevent bronchospasm; these near toxic doses, however, might have undesirable side effects like tachycardia or temperature rises, especially in children. In young and vigorous adults we prefer scopolamine to atropine, as we consider the additional psychic effects and retrograde amnesia desirable. In old people, these effects are not as predictable, and the patients are usually more composed anyway and do not need heavy sedation.

There is considerably less unanimity about other drugs that are cus-

tomarily used for preoperative medication. Years ago morphine was generally used, and it still seems superior for pain relief (at least that is our impression). However, its side effects in adequate doses, especially on old people, have stimulated the appearance of numerous other drugs. We limit ourselves to Meperidine in doses from 50 to 125 mg. depending on the patient's age and weight; we are reluctant to use it in patients with ventilatory insufficiency, as in emphysema or pulmonary fibrosis accompanied by inadequate blood oxygen saturation.

Whether barbiturates actually protect patients from an over-dosage of local anesthetic drugs or not, we still like to use them in all patients scheduled for local or regional anesthesia. Whether there is a need for them in general anesthesia, which is used in most thoracic operations, I cannot state; we use them here because it is more or less accepted practice. At present, it is rather "fashionable" to use a drug of the phenothiazine or chlorpromazine group for preoperative sedation. Laborit and other French authors found the drugs useful in the induction of what they call "Artificial Hibernation". Their "lytic cocktail" never became very popular in this country where hypothermia by physical rather than by pharmacological means is preferred. We cannot present any exact studies, but we were not too impressed with their claimed effects in sedation, reduction of the amount of anesthetic drugs and the lessened incidence of postoperative nausea and vomiting. Also, we encountered a few unpleasant hypotensive states that forced us to cancel the operation. The hypotension did not recur when we omitted the drug in the same patient without other changes in premedication. We occasionally use a "tranquilizer" together with a barbiturate the night before surgery in unusually apprehensive and agitated patients.

So much about preoperative evaluation and preparation. Before we discuss the conduct of anesthesia and the special problems of chest surgery, I would like to say a few words about the effects of the patient's position upon his vital signs and functions.

Position

There is enough accumulated evidence to show that the supine position normally interferes least with ventilation, cardiac output and blood pressure, and it is still our preferred position in the poor-risk patient. Unfortunately, the exposure it provides for interpleural operations and for some operations on the chest wall, like thoracoplasty, is less than satisfactory. Modified prone position with the patient supported from the arms, shoulder girdle and pelvis has been very satisfactory in exposure and freedom from interference with the vital functions. However, the act of positioning seems a major procedure in itself, special attachments (Naclerio) are needed, and the position never became very popular outside certain centers. The lateral position, which is most frequently encountered, has only one point to recommend it: one person, properly trained, can turn the patient easily enough; the fact that many patients develop hypotension just from turning should cause more concern than it does. We feel very strongly that the patient's chest should be placed upon a rubber ring, to reduce interference with the expansion of the dependent chest by the patient's weight as well as with the blood flow

to and from the dependent arm. However, one serious problem is made more serious by the lateral position: The flooding of the dependent lung with blood, with secretions from bronchiectatic bronchi or with pus from a lung abscess is a very real danger and requires special measures, like insertion of a single tube into the dependent mainstem bronchus (Bonica), of a double lumen catheter (Carlens) or a blocker into the main bronchus of the diseased side. We will discuss this problem later on with the question of maintenance of a free airway.

Physiology and Pathology of the Open Chest

Before discussing the actual conduct of anesthesia for chest surgery, we want to review shortly the features that make thoracic operations so different from all other types of operations, namely, the open chest with unilateral or bilateral pneumothorax and, in certain intracardiac operations, the open heart and the interruption of the free circulation of blood for varying periods of time. The technical development of the pump oxygenator and its use in cardiopulmonary bypass permits surgery under direct vision in the open heart. The problems involved are numerous. Fragmentation of red blood cells by pump action with hemoglobinemia, shifts in the pH of the blood (which may or may not be controlled by the addition of CO_2 to the oxygen in the oxygenator), disturbance of the blood clotting mechanism with marked postoperative bleeding are only a few of the difficulties that still face us. In addition, there are problems connected with the production of cardiac arrest, its duration, reliable method to restart the paralyzed heart and the dangers of air embolism from the open heart. Hypothermia, which was widely used before the perfection of the pump and is still used, has problems of its own, especially the occurrence of ventricular fibrillation at low temperatures and disturbance of blood clotting. All that can be said before a group devoted to the improvement of clinical anesthesia is that at this time open heart surgery with induced cardiac arrest and cardiopulmonary bypass requires personnel and equipment available only in large research and teaching institutions. Whether methods and equipment will ever be standardized to a point where they can be safely used by the majority of us, only the future can tell.

Compared with these unsolved problems, the handling of the open pneumothorax is well established by now. Maintenance of life with continuous or intermittent rhythmic inflation of the lung with bellows in the presence of an open chest was demonstrated by Hook nearly 300 years ago. It was well known many years ago that patients with pleural empyema of long standing had a fair chance of surviving thoracotomy, as the mediastinum was stabilized by adhesions, and that these patients could survive a unilateral pneumothorax. A normal mediastinum, on the other hand, would gradually shift, embarrass the opposite lung and interfere with the venous return to the right heart. Death was usually due to circulatory failure and heat loss long before the mediastinal shift would seriously hamper oxygenation. Around the turn of the century, Tuffier in France showed that animals with pneumothorax could be kept alive by inserting a tube into the trachea and blowing in air under pressure. The original purpose of the endotracheal tube, so important to us

for maintenance of an unobstructed airway, was to control mediastinal shift in the presence of an open pneumothorax.

Graham's work on pneumothorax, finally, showed that any type of pneumothorax will affect both lungs. He also pointed out that a bilateral pneumothorax was fatal only in the presence of large openings into the pleural cavities and that any pneumothorax, unless promptly treated, would be fatal whenever it would decrease the vital capacity to the level of the tidal volume. Paradoxical movements of the chest wall after thoracoplasty might have similar effects.

It was also shown that the endotracheal tube could provide temporary relief in a tension pneumothorax, but that the tremendous pressures needed to stabilize the mediastinum seriously interfered with venous return and cardiac output. Sauerbruch in Germany, soon after Tuffier, approached the problem in an ingenious, but rather complicated, way by putting the operating team and the patient's thorax in a negative pressure chamber. The patient's head and the anesthetist alone were kept outside the chamber, and the lung was kept inflated by the higher pressure of the atmosphere. Thus, endothoracic surgery was made possible in the presence of a normal, unstable mediastinum. Once this principle of differential pressure was established, the conduct of anesthesia and surgery could be careful, unhurried and with proper attention to detail. Refinements, like the cuffed endotracheal tube allowed maintenance of enough pressure to stabilize the mediastinum without interfering with the venous return, maintenance of a free airway and the aspiration of secretions, and the intermittent inflation of the collapsed lung. We feel that 5 mm. to 10 mm. of positive pressure during inspiration through a large bore tube is normally adequate to stabilize the mediastinum and to provide adequate air or gas volumes. For short periods the pressure may be increased to inflate the lung and to test suture lines of the bronchial stump, but the higher the pressure and the longer its duration, the more likely is the occurrence of complications, like rupture of blebs with contralateral pneumothorax and prolonged hypotension. Narrow tubes (such as the previously mentioned endobronchial tubes) require of course higher pressure to deliver the same volume of gases. This is a drawback of these often life-saving tubes. Another limitation of the endobronchial tube is the difficulty or impossibility to inflate the unintubated lung or to aspirate secretions.

Whether to provide the necessary ventilation and oxygenation by manual compression of the breathing bag or by a mechanical device, needs some discussion, and I want to say a few words in favor of manual breathing. I do not know of any other method that can give you almost immediately a feel of the patient's depth of anesthesia, the status of his muscular relaxation and the compliance of his lungs even though it might need some intelligent reasoning to determine which one of these factors produces that particular sensation of resistance when you squeeze the bag. Of course, it means: hands on the bag all the time! If you are alone, especially in thoracic surgery, a mechanical device might give you freedom to use your hands for other procedures. In many cases, any ventilator that will deliver gas mixtures with intermittent positive pressure is adequate, provided it fulfills the following requirements:

It should be easily triggered by the patient's own inspiratory movements and should act as an assistor and convert to automatic cycling whenever the patient is in complete apnea. The pressure curve should simulate the natural pattern, a gradual build-up during inspiration, a short peak and rather rapid drop during expiration. In those patients where pulmonary compliance is reduced by fibrosis, emphysema or pulmonary congestion, a negative phase might be desirable or essential to insure adequate exchange of gas volumes and venous return to the right heart during one cycle. It is important that you measure the actually delivered volumes in pressure limited devices or keep track of the intratracheal pressures, where a fixed volume is pumped into the lungs. Otherwise, dangerously high pressures might develop, or the gases might be blown into the room instead of the lungs in patients with reduced compliance on a pressure limited ventilator.

This might be the proper place to discuss the effects of prolonged oxygen administration under high pressure. There is enough evidence to show that 100% oxygen in prolonged use has a toxicity of its own. Suffice it to say that, with flow rates and pressures customarily used in surgical anesthesia and within the normal time limits of such procedures, such toxicity presents no problem. More important is differential absorption of gases (and volatile anesthetic vapors) at pressures different from the atmospheric pressure. Your apparatus may deliver a fixed flow of oxygen and nitrous oxide, say 50% each. It is reasonable to assume that at ambient pressure this ratio will be maintained in the blood stream and, assuming denitrogenation, in the tissues. At higher pressures, nitrous oxide is absorbed at a higher rate, and your arterial and tissue oxygen saturation might be considerably lower than the flow rates lead you to assume. One more reason to avoid prolonged application of high intratracheal pressures!

Conduct of Anesthesia

This brings us to our subject proper, the conduct of anesthesia for thoracic surgery. First, a few words about the different types of regional anesthesia that may be useful in chest surgery. Local anesthesia and intercostal nerve block are useful for minor procedures on the chest wall, such as removal of a tumor, or thoracocentesis, or therapeutic pneumothorax, or even resection of a rib for drainage of an empyema. Spinal anesthesia has been used in some places for thoracoplasty, and favorable reports have been published; we have no experience of our own, and would be reluctant to use spinal anesthesia because we do not know how predictably severe hypotension and intercostal and phrenic nerve paralysis can be avoided, even with use of such special techniques as Etherington-Wilson's light Nupercaine. We feel that a continuous epidural block in such a case is preferable; the anesthesia it produces has a lower as well as an upper limit, and we were very much impressed with the bloodless field in a warm and dry patient; occasionally one encounters spotty anesthesia that requires some kind of supplemental anesthesia.

Next, the use of hypnosis in general and in thoracic surgery is definitely feasible, provided the patients are properly selected, and the hypnosis is in competent hands. About 40 years ago, I, personally, participated

in many deliveries under hypnosis, limiting myself to the obstetrical management only, and was much impressed with the possibilities of properly conducted hypnosis. I would not at all be surprised if Artusio's successful management of cardiac surgery with ether analgesia that enables him to arouse the patient at any time, is actually, a modified form of hypnosis.

However, for most of us, thoracic surgery is still performed with the patient under some kind of general anesthesia. Ideally the drug or drugs you select should be those that are safest for the particular patient and operation. Unfortunately, we frequently have to compromise. The use of electro cautery excludes all flammable agents. Local customs or preferences (or prejudices) far too often dictate the selection. Ultra short acting barbiturates are easy to administer, provided you can hit a vein. The patients show a decided preference for them. Barbiturates are selected regardless of the evidence which shows definite limitations, such as cumulative effects of prolonged administration, effects on the parasympathetic end organs with bronchospasm, and others. We use muscle relaxants and are happy about our quiet field. If we use the latest one put on the market, we feel safe and up to date; after all, that is the story your drug salesmen may have told you. Nobody has been able to refute the statistics of Beecher and his group, which show a higher postoperative and operative mortality, regardless of the operation or anesthetic drug, whenever a muscle relaxant was thrown into the anesthetic salad. I do not say, you should not use curare-like drugs, but I do feel that our responsibility does not end with the last skin suture. Far too many patients, that are responding at the end of surgery, go back into profound narcosis or develop disturbances of their breathing pattern and profound hypoxia after use of muscle relaxing drugs, depolarizing or non-depolarizing! You are fortunate, indeed, if you can turn over your patient to a well run recovery room or an intensive care unit where such frightening disturbances can be detected before irreversible damage to the myocardium or the brain develops. Prolonged drug administration of these drugs can also contribute to overloading of the right heart by sheer volume. The following case will illustrate our problems.

First Admission. A 58 year old retired, white male was admitted to the hospital for increasing hoarseness of 17 months duration. 16 months prior to admission a laryngeal biopsy had been performed in a service hospital for a benign laryngeal tumor.

The history was otherwise noncontributory. An open reduction of a fracture of the right radius and ulna had been performed at the age of 12 years under ether anesthesia; an open reduction for a fracture of the left tibia 13 years prior to admission under spinal anesthesia. He was a heavy cigaret smoker and had been hospitalized for pneumonia at the age of 47 and 57 years.

Physical Examination:

Height—68"; Weight—185 lbs.; ruddy complexion; barrel chest; hemoglobin—17.8; cardiolipin—positive; Kolmer—negative.

Chest X-ray obliteration of the right costophrenic sulcus by adhesions and some calcifications in the left hilus. A "mass lesion" of the left larynx was also described.

A laryngeal biopsy under local anesthesia revealed an "atypical" papil-

loma of the arytenoid area. During convalescence the patient developed urticaria after both penicillin and streptomycin.

Second Admission (One month later). Under topical anesthesia of the larynx combined with Pentothal 2.5% 500 mg. and oxygen by nasopharyngeal catheter, the whole area of hyperkeratosis and acanthosis was stripped of the arytenoid area. Duration of anesthesia—15 minutes. Awake on return to recovery room. Blood pressure throughout 120-100 systolic, 80-60 diastolic.

Third Admission (Four months later). For increasing hoarseness and difficult breathing. Blood pressure 160/80. Chest X-ray revealed now some tortuosity and widening of the aorta. The "stripping" procedure was repeated. Premedication: Demerol 100 mg. and atropine grs. 1/150 one hour before induction, and was inadequate. Topical and Pentothal 1 gm., as previously. Duration of anesthesia—40 minutes, blood pressure between 140/120 systolic and 100/90 diastolic. Awake in recovery room.

On discharge 4 days later a new hyperkeratosis already developed in the "stripped" area.

Fourth Admission (Five weeks later). A laryngofissure was planned for a more thorough removal of a *sub*-glottic hyperkeratosis, but patient declined and left hospital.

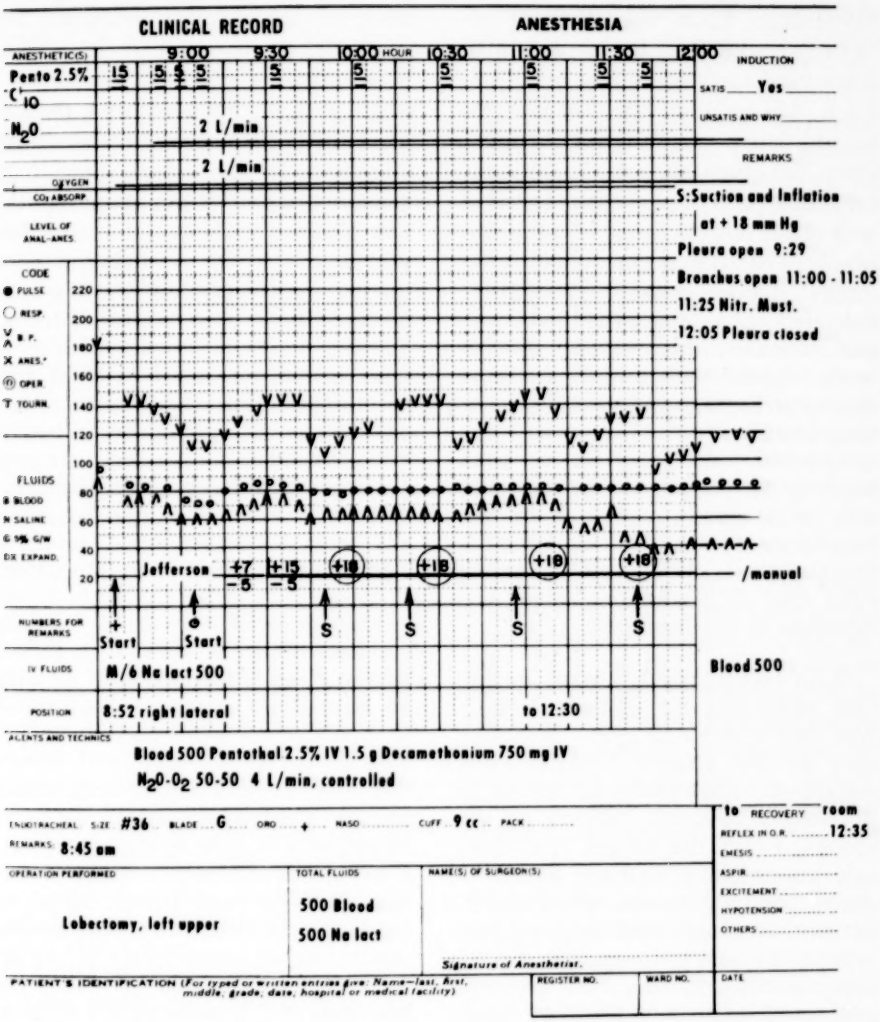
Fifth Admission (Twenty months later). Admitted for the same condition with marked stridor, dyspnea and hoarseness. Blood pressure now 180/100, hemoglobin 15.8 gm., hematocrit 55. Premedication: Seconal 100 mg. and Phenergan 25 mg. 75 minutes and Demerol 100 mg. plus atropine grs. 1/150, 60 minutes before induction with moderate sedation. A nasotracheal #24 Saunders tube was inserted in the trachea under direct vision and a thorough removal of all hyperkeratotic areas was undertaken. Duration—73 minutes. Pentothal 975 mg. and 0.2% succinylcholine 600 mg. with controlled ventilation. Blood pressure between 170/120 systolic and 100/80 diastolic. For the last 15 minutes the control was inadequate, after the cuff and the tube had been punctured by a punch forceps. Reintubated with a #36 Magill tube at end of surgery and adequately oxygenated and breathing spontaneously. Marked laryngeal edema was described during first 36 hours postoperatively, but a tracheostomy was not done. Patient could be aroused but slept for the first 24 hours without any medication.

Sixth Admission (Eight months later). Admitted for same condition. Weight gain to 195 lbs. In view of prolonged depression after last operation, premedication was reduced to Phenergan, atropine and Demerol 75 mg. Duration of anesthesia—80 minutes, total Pentothal 700 mg., succinylcholine 500 mg. with #24 cuffed nasotracheal Saunders tube. Cuff at first impinging upon the operative field, but after advancement for another 2 cm. no further problems. Awake in recovery room.

Last (Seventh) Admission (Three months later). Admitted for the same difficulties. In addition, severe pain had developed over right scapula during the last 4 weeks. Shortness of breath seemed worse than ever before. Blood pressure—200/100. Routine chest film showed a rounded mass in the left chest, at the level of the second rib, 2½ cm. in diameter; it was interpreted as a primary or metastatic tumor of the left upper lobe. An

X-ray survey revealed a radiolucent area at the tip of the right scapula (suspicious but not conclusive for metastatis), otherwise IVP, KUB, GI series and bone survey were negative. Hemoglobin—17.8 gm., hematocrit—55, protein—7.5 (albumin 4.8 globulin 2.7), BUN—20, alkaline phosphatases—1.4 U, ECG—normal, except for inverted T in AVL. Timed VC compatible with obstructive emphysema. Prostate twice the normal size but soft. Neurologically, including EEG,—negative. Patient was put on a reducing diet, and 2 weeks after admission a bronchoscopy and laryngoscopy with removal of hyperkeratotic lesions were performed in one session. Duration—70 minutes. Premedication—atropine grs. 1/150 only with patient extremely agitated and apprehensive. Topical anesthesia of larynx and trachea, followed by Pentothal and Anectin and controlled ventilation via a Rieker operating bronchoscope. A #24 Saunders tube was then introduced alongside the bronchoscope and the latter removed. Total Pentothal—425 mg., Anectine—200 mg. and N_2O-O_2—50/50%, 3 liters each. Uneventful recovery. Patient was scheduled for exploratory thoracotomy, but the procedure had to be repeatedly postponed on account of an outbreak of an influenza-type upper respiratory infection among personnel and on the ward. His weight, meanwhile, had been reduced to 155 lbs. (1200 calorie diet).

Thoracotomy 4 weeks after last anesthesia. Premedication: Phenergan—25 mg., Demerol—100 mg. and atropine grs. 1/150 one hour before surgery with good sedation and without depression. Left upper lobectomy under endotracheal anesthesia (#36 Magill tube, oral with 9 cc. of air in cuff) easy intubation with Pentothal 300 mg. and decamethonium 1.5 mg. Maintenance on Jefferson Ventilator +7/—7 mm. during closed and +15/—5 mm. during open chest and N_2O-O_2 50/50%, 4 liters and 100 mg. increments of Pentothal and decamethonium as needed. Total Pentothal 1.5 gm. C_{10} 7.5 mg., 1000 cc. of fluids were given I.V. (500—blood, 500 M/6 Na. Lact.). The only remarkable item was the need for 18 mm. of positive pressure whenever we inflated the lung, and this was followed by a drop of 30 to 40 mm. in the systolic pressure (180 on arrival, 140 after intubation and positioning, and reverting to 140 after each post inflation drop). Another drop occurred at the termination after an experimental cancerocidal drug had been installed in the thoracic cavity (90 mm. and promptly returning to 120 mm.). Patient was returned to recovery room with the tube in place and put on a Bennett Assistor at 12:30 p.m. (total time—4 hrs.) blood pressure—160/100, at 12:40 p.m. Awake and objecting to tube at 2:30 p.m.—extubated but breathing inadequately and re-intubated over his protest. Blood pressure 200/120, dropping to 140/80 on Bennett. The patient, though awake, never seemed able to establish a normal breathing pattern, periods of spontaneous breathing with the Bennett Assistor followed by apnea, when the automatic cycler had to take over. Around 6:15 p.m. a blood pressure drop and thready pulse developed, Levophed started—7:30 p.m. cardiac arrest (asystole) followed by immediate thoracotomy and resumption of cardiac action without any other treatment than palpation. Blood pressure 120/80, not responding otherwise; breathing pattern unchanged. Dead at 9:05 p.m., suddenly. An autopsy was performed which showed not



only atelectatic areas in the left lower lobe and marked emphysema, but also metastatic foci in the adrenal glands and in the brain. It is easy to state that the patient died from metastatic cancer, but do we really know whether his death was not due to a *relative* overdose of thiopental or decamethonium in the presence of disturbed pulmonary function?

Please, do not misunderstand me. I do not want to discourage the use of these drugs; however, I do want to stress the fact that we deal with powerful agents whose effects may not always be predictable.

In my lifetime I have seen the change from chloroform and drop ether to semi-closed and closed gas mixtures, to avertin and rectal ether and thiopental, from assisted to controlled breathing and finally to the cardiopulmonary bypass with induced cardiac standstill and use of the pump

oxygenator. Each step forward included an additional interference with some vital function of the organism. Each step required the development of additional monitoring techniques. Once, the observation of the patient's breathing pattern and color, together with a five minute check of pulse and blood pressure, seemed quite adequate. Now we measure the actually delivered gas volumes, the blood oxygen saturation and carbon dioxide levels together with the pH and take electrocardiogram and electroencephalogram. No doubt, all this and more is essential for surgery on the open heart or in prolonged hypothermia, and to a certain extent it is our familiarity (or the lack of it) with these methods which will determine what kind of procedures can be undertaken in our hospitals.

With this in mind, I want to discuss anesthesia for thoracic procedures that involve an open chest, but that do not require complicated equipment. That limits our review to pulmonary resection, surgery of the esophagus and diaphragm, transthoracic abdominal procedures like total gastric resection and splenectomy, pericardial surgery and the few blind intracardiac procedures like mitral commissurotomy, etc., that are still performed without establishing a bypass through a pump oxygenator. We discussed the preoperative management earlier. Adequate sedation and reduction of secretions by antibiotics, bronchodilators, defoaming agents via a nebulizer and postural drainage are most important. We also teach our patient certain breathing and coughing exercises preoperatively, to insure adequate ventilation in the postoperative period. Whatever anesthetic drug you select, maintenance of an unobstructed airway and adequate oxygenation are the primary conditions for successful management. A quiet hilus is essential for pulmonary resection; whether it is produced with muscle relaxants or with controlled breathing at deeper level of anesthesia, it is mandatory that we maintain ventilation either manually or by use of a ventilator. May I remind you that there are only very few contraindications to the use of endotracheal tubes, but the presence of tracheal ulcerations in tuberculosis is a most important one. For this reason alone, all patients with pulmonary tuberculosis scheduled for thoracic surgery (or any other procedure requiring intubation) should be bronchoscoped and, when ulcers are found, properly treated before undergoing operation.

Regardless of the drugs selected for maintenance of anesthesia, induction in many places seems to be with an ultra short acting barbiturate; it is certainly a less unpleasant experience for the patient than mask induction and, in combination with either topical anesthesia to throat and larynx or a muscle relaxing drug, allows rapid and non-traumatic intubation. In either case, a short period of vigorous ventilation with high oxygen concentrations immediately before intubation seems greatly to reduce the problems of a hypoxic period with its effects upon myocardium and the brain. The fine art of smooth induction with nitrous oxide seems to become extinct; certainly, the trend is away from it.

Maintenance with ether provides "one-drug" anesthesia, an invaluable experience for the student to learn how to evaluate the depth of anesthesia. Brewster has shown that ether has a direct depressing effect upon the myocardial muscle cells, just like

all other anesthetic drugs; ether is unique in stimulating in the intact animal the output of epinephrine and nor-epinephrine, thereby balancing (or masking?) the direct myocardial effect. It is possible to produce a quiet field with ether alone and maintain adequate oxygen levels with controlled breathing; whether the depression of all functions accompanying the necessary depth of anesthesia is desirable, is another matter. I, at least, feel that there are now safer ways available than deep ether anesthesia to obtund dangerous reflexes that may be active during light anesthesia.

Cyclopropane is, in my opinion, a most valuable agent. It does not produce metabolic acidosis and for that reason alone seems particularly useful in the presence of liver disease, severe diabetes and other metabolic disorders. To produce a quiet field, it has to be combined with a muscle relaxant, or the patient has to be carried into the stage of respiratory arrest. It seems well established that prevention of hypoxia and hypercarbia by assisted or controlled breathing has greatly increased the safety of this drug by reducing the incidence of cardiac disturbances, so-called cyclopropane shock and emergence delirium.

Both ether and cyclopropane can be given with high oxygen concentrations. Unfortunately, both are flammable and cannot be used in the presence of electro-cautery.

Nitrous oxide with adequate oxygen levels does not produce adequate anesthesia for intrathoracic surgery. Combined with small doses of an ultra short acting barbiturate and a muscle relaxant, we can produce a quiet field, maintain controlled respiration and avoid excessive depth of narcosis. Instead of nitrous oxide, small doses of a narcotic can be used to produce analgesia and enhance the hypnotic effect of the barbiturate. The drawbacks of these drug combinations are the drawbacks of all multiple drug administrations. You do not have to be a pharmacological purist to find the array of drugs confusing and most difficult to evaluate. In relying on them for chest surgery, we really do not know at each moment, as we should, what is happening—we are proceeding by more or less educated guesswork; amazingly enough, in most hands and with most patients it works. That it does not always accomplish its purpose has been shown in our single case presentation.

I do not want to discuss the newer drugs like trichlorethylene or the fluoridated hydrocarbons in chest surgery. They are non-explosive and pleasant to take—they are also chemically close enough to chloroform to make me reluctant to use them for chest surgery in my patients, the majority of whom are old and have a damaged cardiovascular system.

Finally, some closing remarks: There is the effect of intrathoracic surgery upon the cough-reflex and the spread of pulmonary tuberculosis into previously uninvolved sections of the lung. 15 to 20 years ago this was a major problem; now that our patients are maintained on Isoniazid and other drugs, we do not seem to encounter spread quite as frequently or, whenever it does occur, seem to be more confident in our ability to control such spread.

Whatever the drug or drugs used, frequent aspiration of secretions and intermittent inflation of the collapsed lung are essential if you want to

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Postanesthetic Backache and its Relation to the Use of Muscle Relaxants

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Positioning of the patient during surgery is important not only from a respiratory and circulatory point of view during a procedure but has also been implicated in postoperative neuropathies and backache. The significance of this last factor has caused certain authorities to recommend use of a folded sheet or small pillow under the back with the patient in the supine position to maintain the lumbar lordotic curve and thus prevent postoperative backache. Others recommend use of a "basic flexed position", i.e., moderate flexion of trunk and knees to prevent this.

In recent years, the introduction and wide use of muscle relaxants has added another facet to this problem of postoperative backache. In addition to muscle relaxants relaxing the normal lordotic curve more completely than light anesthesia alone they also may cause muscle pains following their use. This has been noted with succinylcholine. Because of these factors, it was felt necessary to reappraise the incidence of postoperative backache and its relation to the use of muscle relaxants.

Method

Seventy-three patients, all in good physical condition (physical status 1-2), were randomly chosen over a period of five months. They ranged in age from thirteen to fifty-seven years and included both sexes. All patients received a general anesthetic in the supine position for a time period of not less than one hour and ranging up to five hours in duration. Induction of anesthesia was accomplished most frequently with Sodium Pentothal and maintained with nitrous oxide and oxygen and/or ether, Fluothane, trichlorethylene, meperidine or phenazocine with or without muscle relaxants. The muscle relaxants used were d-tubocurarine or succinylcholine. The supine position was assumed on a standard operating room table and pad, and not modified by adjusting the table or using any other means of additional support to the back.

The patients were questioned thoroughly as to their previous history of backache and its relationship to any previous surgery. No particular em-

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phasis was placed on this one factor. If a patient complained of backache, he was further questioned concerning its etiology, severity, frequency of recurrence, duration, and area of the back involved. Backache was graded according to the intensity of pain and the constancy of the symptom. Grade 0 patients had no history of backache, 1—mild backache, 2—moderate, 3—moderately severe, and 4—severe backache requiring bed-rest as treatment. Patients with backache in areas other than the lumbar region were excluded.

Postoperative follow-up for this complaint was done on the second or third day after surgery and if there were any significant findings, the patient's condition was followed for one week.

Patients in the control group had no muscle relaxants used during anesthesia; patients in the other group had either d-tubocurarine or succinylcholine administered to them.

Results

Of a total of eighteen patients in the control group, three had backache preoperatively. Postoperatively, only one patient had backache. This was of the same degree as it was preoperatively. No patient who was asymptomatic developed backache and most of the symptomatic patients had their discomfort alleviated postoperatively. (See Table)

Fifty-five patients received muscle relaxants; nineteen had backache preoperatively, eight had backache postoperatively. Eleven of the preoperatively symptomatic group had no backache at all after surgery; three patients in this group were improved but not completely, two had no change, three patients had backache that was one degree more severe. These latter were all females.

The data were further analyzed, and it was determined that these same three patients had all received a succinylcholine intravenous infusion to provide muscular relaxation, two with nitrous oxide supplemented with Pentothal and meperidine and one with nitrous oxide and Pentothal.

The use of a narcotic as an anesthetic adjuvant was not significant in affecting the results.

Other factors that might affect the general decrease in postoperative backache are preponderance of incisional pain, the psychological distraction of hospitalization, and the postoperative use of narcotics. This latter factor was followed, and none of these patients had narcotics throughout the follow-up period.

Effect of Anesthesia With and Without Relaxants on Backache

Grade of Backache	Control		Relaxants	
	Preop.	Postop.	Preop.	Postop.
4	1			
3			1	1
2	1	1	9	3
1	1		9	4
0	15	17	36	47

Three cases who had received muscle relaxants during surgery complained of an increase in back pain of one grade. This might be due to excessive relaxation of muscle tone and subsequent increased ligamentous strain, use of beds with unsupported mattresses and poor regulating of postoperative bed posture or a general increase in awareness of physical complaints with hospitalization. Corroboration of the first factor seems to be lacking in view of the general trend in the experimental group.

Patients who do not have backache preoperatively apparently require no special precautions in supine positioning during surgery. If they are to receive muscle relaxants during surgery, use of the basic flexed position or flexion of the knees might prevent a possible aggravation of pre-existing backache, although it is most probable that this precaution is unnecessary. Use of anything that would extend the vertebral column is contrary to orthopedic principles. The choice of anesthetic agent is of no apparent significance.

Comment and Conclusions

From the above results, it is apparent that patients with preoperative backache did not have their symptoms aggravated and many had them alleviated following anesthesia in the unmodified supine position without the use of muscle relaxants.

With the use of muscle relaxants, the same general trend was noted except for the three patients previously mentioned.

Lumbosacral backache is most commonly related to posture when no specific demonstrable pathology is present. Treatment of these patients depends on a proper postural program, most often with a reduction of the lumbosacral angle as its objective. The patient exercises and adjusts his posture so that he can live twenty-four hours a day without a hollow in the lower part of his back. Translating this to the supine anesthetized patient, it follows that a pillow or folded sheet put under the lumbosacral area of such a patient would increase the lumbosacral angle and, therefore, place more stress on the ligaments and muscles of this region. The firm flat mattress of an operating table seems to be most consistent with the aims of orthopedic therapy for low back disorders. The basic flexed position of the supine patient would probably take even more stress from the area.

Summary

The significance of backache in supine anesthetized patients was investigated in eighteen patients who did not receive muscle relaxants and fifty-five who did.

No patient, who was asymptomatic before surgery, developed backache after it. Three patients in the control group had backache preoperatively, two of these had none and one had the same degree of discomfort postoperatively. Nineteen patients in the relaxant group had preoperative backache; eleven of these had none postoperatively, three had incomplete and two had no alleviation of symptoms, and three females had backache one degree more severe.

Patients without any backache preoperatively require no special precautions when in the supine anesthetized position. Those with preoperative backache should be treated the same with the possibility that use of the basic flexed position will help. Use of a roll or pillow under the lumbar spine is probably detrimental.

New Accessory Drugs Used in Anesthesia

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The classes of drugs that will be discussed are as follows: the tranquilizers, barbiturate antagonists, narcotic antagonists, and antagonists to muscle relaxants. The curariform action of antibiotics will also be discussed.

Tranquilizer is a term which has been introduced to denote a new group of drugs such as the phenothiazines, rauwolfia derivatives, and meprobamates. This term is used by some to imply control of psychomotor excitement without excessive cortical depression, that is, without the loss of rational or discriminate thought. Tranquilizers are presumably distinct from the barbiturates or sedatives in that they are supposed to produce quiescence without producing as much impairment of performance. However, simply defined, a tranquilizer is a drug that produces peace of mind. The tranquil state can be accomplished by a host of drugs such as the barbiturates, alcohol and the narcotics. Therefore, the recommendation[1] has been made that the term tranquilizer be discarded and that this group of drugs, instead of being called tranquilizers, should be classified according to their effect on the central nervous system. Following such a scheme, the phenothiazines and rauwolfia derivatives which produce suppression of sympathetic nervous system and are active in the hypothalamic area would be called central sympathetic suppressants. The meprobamates (Equinil or Miltown) which produce skeletel muscle relaxation and are active in the thalamus would be central muscle relaxants.

The Phenothiazines

The phenothiazines which have been used extensively in anesthesia are shown in Table 1. The first phenothiazine used to any extent in medicine was promethazine (Phenergan).

Table 1.
Phenothiazines:

Drug		Dose-mg.
Chlorpromazine	Thorazine	5-50
Promethazine	Phenergan	12-50
Promazine	Sparine	25-50
Prochlorperazine	Compazine	5-10
Perphenazine	Trilafon	4- 8
Mepazine	Pacatal	25-50

It was used as a long acting antihistaminic. It was soon realized that this agent potentiated the effects of barbiturates and narcotics. Therefore, a search for other compounds related to promethazine was started. In 1952, chlorpromazine (Thorazine) was introduced. Chlorpromazine has a wide variety of effects and is probably the most versatile drug of the group. However, it has a very serious draw-

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back—the production of hypotension and tachycardia.

Chlorpromazine. The hypotension produced by chlorpromazine is difficult to reverse. It is probably due to peripheral vasodilatation and suppression of the vasomotor center. It produces reversal of the action of epinephrine. That is, in a patient who has received chlorpromazine and is hypotensive, epinephrine may cause a further fall in pressure. The hypotension does respond to norepinephrine, neosynephrine, Vasoxyl, and Methedrine in doses greater than ordinarily used clinically.[2] It is not recommended that chlorpromazine be used in conjunction with spinal or epidural anesthesia because profound hypotension difficult to reverse may ensue.

Thorazine by itself does not produce any respiratory depression. However, the respiratory depression of narcotics is intensified. When chlorpromazine first was introduced, we used 25 mg. intramuscularly as preoperative medication in a patient who was sensitive to morphine sulfate and other narcotics. It was found that the patient simply would not breathe enough to become fully anesthetized. Intubation of the trachea was accomplished with a relatively low blood level of cyclopropane and the help of a muscle relaxant.

Chlorpromazine does not have so great a tendency to produce convulsions and extrapyramidal stimulation as do some of the other phenothiazine derivatives. It has been found useful to control the agitation of alcoholism or the excitement after hypoxia. It has been combined with Seconal and scopolamine to provide sedation and to control psychomotor activity during labor. It has also been used for the control of postpartum hypertension which may result from the combined effect of a vasoconstrictor and an oxytoxic drug given within three to six hours of each other. A subarachnoid hemorrhage due to rupture of an intracranial aneurysm occurring in a patient who had received a vasoconstrictor prophylactically before caudal anesthesia for delivery and an oxytoxic at the time of delivery of the placenta has been reported.[3]

Knapp and Beecher[4] found that a dose of 50 mg. of chlorpromazine given immediately postoperatively was effective in reducing nausea, vomiting and wretching for 24 hours. However, it took twice as long for the patients who received chlorpromazine to awaken as compared to those that had not. Furthermore, hypotension of a serious degree resulted in many patients.

Two Danish anesthetists[5] evaluated the use of 50 mg. of chlorpromazine as compared to 10 mg. of morphine sulfate as preoperative medication. They made careful observations on two groups of patients subjected to abdominal hysterectomy. The anesthetic management was standardized, that is, the same dose of thiopental and succinylcholine was used for induction. The anesthetics were given by the same two anesthetists. Maintenance was with nitrous oxide and succinylcholine. Under these conditions, the drugs were remarkably similar. The degree of sedation was identical. Chlorpromazine produced a decrease in the incidence of nausea and emesis. However, recovery was prolonged. Residual neuromuscular blockade or respiratory insufficiency and lethargy was more noticeable with chlorpromazine. These workers tended to favor morphine sulfate to a slight extent.

Promethazine. Promethazine does not seem to have as profound a hypotensive effect as chlorpromazine. Yet, almost half of the normal volunteers given 50 mg. of promethazine intramuscularly and tilted on a table, fainted; that is, became hypotensive.[6]

However, transient hypertension following promethazine given intravenously, has been reported. On several occasions, we have given promethazine intravenously in a deliberate attempt to lower blood pressure but it was ineffective. Furthermore, it has been used intravenously during spinal anesthesia, apparently without much of a hypotensive effect in contrast to chlorpromazine.

The effect of 50 mg. of intramuscular promethazine on the respiration of normal adult males has been studied.[6] The respiratory minute volume was found to be increased and the end expiratory carbon dioxide tension was found to be decreased. This stimulation of respiration was probably due to the restlessness that the volunteers developed. When Phenergan is used in conjunction with other drugs or anesthetics, then it has a depressant effect on the respiration.

I have used the combination of Demerol, Phenergan and scopolamine as preoperative medication for tonsillectomy. It appeared that some of the children had lost their sense of equilibrium and were afraid that they would fall when they were being transferred from the bed to the litter. Even though the medication was given according to weight, it was difficult to obtain a uniformly successful effect; that is, some were too lightly and some too heavily medicated. The children were then given Vinethene and ether by the open technique. Some of the children would simply not breathe sufficiently to become anesthetized and the inductions were slow and tedious. During the procedure, apnea was encountered occasionally when the mouth was opened or when the tonsils were grasped. Furthermore, the children did not seem to struggle against an obstructed airway.

In addition to producing merely restlessness and Parkinsonism, promethazine has produced convulsions in a patient with a history of epilepsy. Therefore, we do not recommend that it be used alone or in the patient with agitation, eclampsia or history of epilepsy.

Promethazine has been used as a premedicant and as an adjuvant during anesthesia. By adjuvant, it is meant that promethazine was given during anesthesia, for example, thiopental-nitrous oxide, to reduce the amount of thiopental necessary in the hope of shortening the awakening time. This, however, did not work out. At the present time there seems to be little justification for the routine use of promethazine for premedication or as an adjuvant during anesthesia.[6, 7]

Promazine. Promazine (Sparine) is less likely to produce hypotension than chlorpromazine. Some authors say that it is relatively ineffective when used alone for the treatment of excitement, agitation, or nervous tension. Agranulocytosis and extrapyramidal motor activity simulating Parkinsonism are seen less often than with chlorpromazine.[8] However, convulsions following the use of promazine have been reported. Some obstetricians prefer promazine to promethazine. Also, it has been found useful to control the agitation of alcoholism.

Prochlorperazine and Perphenazine. Prochlorperazine (Compazine)

and perphenazine (Trilafon) are effective anti-emetics. As anti-emetics they are best used in the immediate postoperative period. They are also effective in the treatment of senile agitation. One of the serious complications resulting from their use even in therapeutic doses is extrapyramidal stimulation to an alarming degree. Dislocation of the jaw and a death from the tetanic contraction of respiratory muscles have been reported.

The Barbiturate Antagonists

Megimide. Megimide was introduced by Shaw in 1954 as a specific antagonist to the barbiturates.[9] However, subsequent workers, notably the group from Copenhagen, were not able to substantiate this.[10] If Megimide were a chemical antagonist or competitive inhibitor, it might be expected that patients would regain consciousness despite a high blood level of barbiturate. But it was found that in patients with severe barbiturate poisoning, Megimide changed neither the blood level at which consciousness returned nor the duration of the coma. Megimide, therefore, should be classified as an analeptic or central nervous system stimulant similar to picrotoxin but with a somewhat wider margin of safety.

Megimide quite consistently stimulates respiration depressed by barbiturate overdosage. The Danish School has successfully restored respiration to normal in patients made apneic by an overdose of barbiturate. Others have successfully used Megimide to stimulate respiration after thiopental anesthesia. Since 1955 there have been many reports describing the use of 50 mg. to 100 mg. of Megimide to shorten the awakening time after thiopental anesthesia. Several reports, one utilizing a double blind technique, could show no significant difference in the waking times between those patients receiving Megimide and those who do not. However, the bulk of the evidence seems to favor a shortening of the awakening time after thiopental anesthesia by Megimide.

Megimide is not without its side effects. Convulsions have been produced in man by doses of 200 mg. or more. Visual hallucinations consisting of black specks, smoke, fire, or colored patterns occurred in 15 out of 50 patients suffering from barbituric acid poisoning who were treated with Megimide. Vomiting and spasm of the masseter muscles may occur. This may lead to aspiration of vomitus if an endotracheal tube is not in place. If an endotracheal tube is in place, bucking and bronchospasm may result.

Ritalin. The literature on methylphenidate (Ritalin) has not been so profuse as that on Megimide. It also is considered to be a non-specific stimulant of the central nervous system, that is, an analeptic. It has been used for the treatment of depression following the use of Reserpine or other tranquilizers, in various depressed mental states, and following thiopental-nitrous oxide anesthesia. In patients who had a dilatation and curettage, the recovery time as measured from the removal of the anesthetic mask to response to verbal command was, for the group receiving Ritalin, about one half as compared with those who had not. The optimal dosage was found to be 0.10 mg.-0.19 mg./lb.[11] Ritalin also has been noted to stimulate the respiration of patients moderately depressed with barbiturates, meperidine or both. Side effects that have been noted are: mild transient rise in blood

pressure, nausea, retching or emesis, restlessness, tremors, relapse and insomnia.

Summary. These analeptics should be used with great caution if at all in the patient with severe barbiturate poisoning. First, because of the excellent results obtained by Nilsson, with merely supportive treatment and with attention to maintenance of respiration and blood pressure, and avoidance of pulmonary and renal complications. Second, because the length of the coma is not shortened despite a rousing effect.

In the moderately depressed patient or one overdosed with thiopental, they may be given a trial in the hope of stimulating respiration and also producing a state of wakefulness. The dose should be limited and if an adequate response is not obtained, then other measures should be used.

In the patient who is only slightly depressed, these drugs can be very useful to establish a quicker return to consciousness and thus an easier nursing problem. Branch has been using Ritalin in ambulatory dental anesthesia patients and believes its benefits outweigh the disadvantages.[12]

The Narcotic Antagonists

The narcotics do have a true antagonist. That is, the respiratory depression, hypotension, nausea and emesis produced by the narcotics can be blocked by these antagonists. There are two narcotic antagonists in common use. Nalorphine (Nalline) which is identical to morphine except for the side chain on the nitrogen which has an allyl group instead of a methyl group. Levallorphan (Lorfan) is related to levo-dromoran as Nalline is to morphine. Lorfan is more widely used because: its use is not restricted by the Harrison Antinarcotic Act; it has a longer duration of action; and is less likely to produce respiratory depression. Nalorphine can produce respiratory depression when used alone as in pulmonary emphysema.

The point that is very intriguing, as well as interesting, is that by selecting the proper ratio of the antagonist to the narcotic, the above undesirable effects can be blocked without significantly blocking the analgesic properties. The ratios for Lorfan that have been worked out by several workers are given in Table 2. The narcotic antagonists have been used for the treatment of depression due to narcotic overdosage including neonatal respiratory depression. If it is used in the narcotic addict, typical withdrawal symptoms will result.

Table 2.

The Following Ratios of Narcotic to Antagonist Have Been Recommended:

Levo-Dromoran/Lorfan	10/1
Morphine/Lorfan	20/1- 50/1
Demerol/Lorfan	60/1-100/1
Nisentil/Lorfan	25/1- 50/1
Demerol/Nalline	20/1

The combination of a narcotic and narcotic antagonist can be used for preoperative medication and as an adjuvant during anesthesia.[13] I use the combination of Lorfan, Nisentil and scopolamine for premedication in children for tonsillectomy. I also use the combination for procedures during which I do not desire to control the respiration. The sedative effects of the narcotic and the antagonist seem to be additive, so larger doses of narcotic need not be used for preoperative medication even though it is combined with a narcotic antagonist. If controlled respiration is employed, the narcotic alone can be used before and during the anesthetic

process to help induce apnea and to provide analgesia. The respiratory depressant effect of the narcotic is reversed with the narcotic antagonist at the end of the operation if necessary.[14] Foldes has used the combination of Nisentil and Lorfan in a ratio of 50 to 1 during obstetrical labor. It produced good analgesia without respiratory depression of either mother or newborn. The combination is also effective for postoperative pain.[15]

Antagonists to Muscle Relaxants

Before we discuss the antagonists to the muscle relaxants, let us briefly review the pharmacology of the muscle relaxants. They have been classified into two groups: the nondepolarizing and the depolarizing agents. The nondepolarizing agents fill the receptor sites at the motor end plate which would normally be occupied by acetylcholine. This prevents acetylcholine from depolarizing the end plate and so the contraction of the muscle. The depolarizing agents also fill the receptor sites, but, because they are similar to acetylcholine, they cause depolarization of the end plate and contraction of the muscle. This is the twitching seen with the injection of succinylcholine. However, unlike acetylcholine, they stay at the receptor sites and prevent the repolarization of the end plate, therefore, the muscle cannot contract again. D-tubocurarine is a member of the nondepolarizing and succinylcholine is a member of the depolarizing group. Recently, there has been some evidence to suggest that succinylcholine, after prolonged usage, acts as a depolarizing agent, and as a result of this, the antagonists to reverse the paralysis of d-tubocurarine, have been used for succinylcholine.[16] The antagonists to d-tubocurarine are prostigmine and edrophonium (Tensilon). These drugs act primarily as cholinesterase inhibitors. Cholinesterase is the enzyme that breaks down acetylcholine and renders it ineffective. So, cholinesterase inhibitors allow a higher concentration of acetylcholine to accumulate at the end plate. Before either one of these drugs is used, however, atropine should be given, preferably a few minutes before. Atropine is used to prevent the bradycardia, bronchospasm and excessive secretions that may result when acetylcholine is allowed to accumulate. The trend has been to give the antagonist routinely at the end of the procedure when d-tubocurarine is used. The dosage is atropine 0.4 mg. to 1.2 mg. followed by prostigmine 0.5 mg. This is repeated if necessary. The British are a little more generous with the dosage, using as much as 2.5 mg. of prostigmine. Edrophonium (Tensilon) has a more fleeting action and there is a real danger of re-appearance of the paralysis in ten or fifteen minutes, so one should follow edrophonium with prostigmine. The dose of edrophonium ranges from 5-20 mg. Cases of prostigmine resistant curarization have been reported. These have occurred primarily in debilitated patients and those with fluid and electrolyte imbalance, for example, carcinoma of the lung and intestinal obstruction.

As far as antagonists to succinylcholine are concerned, one is not on as safe ground as with d-tubocurarine. If one uses the cholinesterase inhibitors, that is, prostigmine and edrophonium, then one has to assume that the succinylcholine is no longer acting as a depolarizing but rather as a nondepolarizing agent. Just when, and if, this occurs cannot be determined

clinically. However, if other measures fail then one can give a small test dose of edrophonium and observe the result. If a beneficial response is obtained, then prostigmine can be given. Prostigmine should not be given first because marked prolongation of the apnea may result.[16]

The Curariform Action of Antibiotics

Neomycin has been reported to have a neuromuscular paralytic effect similar to curare. It is potentiated by ether. Several deaths due to respiratory paralysis following the intraperitoneal installation of neomycin during ether anesthesia have been reported. This effect can be partially antagonized by prostigmine. Calcium has also been reported to be effective. To avoid respiratory paralysis, cyclopropane, which does not potentiate the effects of neomycin, should be used to anesthetize patients receiving neomycin parenterally.[17]

Streptomycin and polymixin B have also been shown to have a curariform action. However, with the doses used clinically, no cases of postoperative apnea have as yet been ascribed to streptomycin or polymixin B.

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Anesthesia for Pediatric Surgery special problems and their management

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Cooperation is the common denominator which produces the successful results so necessary in the handling of the pediatric surgical patient. This is even more important in the field of plastic, head and neck, and neurosurgery where the child is likely to require repeated surgical exposure.

The basis of this presentation is experience involving over 1500 cases from the surgical services at The Grace Hospital, Detroit, over a five year period. The ages of patients in this series range from six hours to nine years. All types of surgical cases from the various speciality divisions are considered. These include plastic surgery, neurosurgery, cardio-thoracic, orthopedics and general surgery. All patients received some form of general anesthesia. Of the total number of patients in this series, over one-half received a muscle relaxant following induction. The relaxant, succinylcholine chloride, is a short acting drug which produces optimal relaxation for endotracheal intubation. In essence this is a presentation of the merits of endotracheal anesthesia in pediatric surgery. Regional or local anesthesia in the main, has little place in this area by virtue of the age of the patients and the need for optimal operative conditions.

There have been no anesthetic fatalities in this group nor has there been any postoperative morbidity related to anesthesia, (that is, atelectasis, bronchopneumonia, laryngeal edema, etc.).

Much has been written on the subject of pediatric surgery. However, since so much is at stake in these young people, perhaps this presentation will be of value to you when faced with problems similar to those which we have encountered in this field.

Premedication

Aims. 1. Reduce fear and apprehension. 2. Reduce bothersome secretions in the tracheobronchial tree. 3. Reduce noxious reflex activity. 4. Reduce metabolic activity.

To achieve the above aims, each child is pre-operatively medicated on a weight basis; the child's weight being considered the more valid basis

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for establishing dosage. In general, the child receives a barbiturate in rectal suppository form, one and one-half to two hours pre-operatively. This is followed by a hypodermic injection of a narcotic plus a belladonna derivative. The latter is given forty-five minutes to one hour before surgery. This combination of drugs generally fulfills the aims of premedication.

ence as well as others that there can occur considerable depression of respiration, and there can be a prolonged emergence from anesthesia. When rectal Pentothal is to be used, only a belladonna derivative is given as premedication.

It would be well to state emphatically at this point, that it is with the premedication of the child that the anesthetic really begins. Ventilation,

Table 1

Table for Pre-operative Medication for Infants and Children

Age	Av. Wt.	Rectal Seconal or Nembutal		Morphine		Atropine		Scopolamine		Demerol
Newborn	lbs. 7	mgm. —	gr. —	mgm. —	gr. —	mgm. 0.1	gr. 1/600	mgm. —	gr. —	mgm. —
6 mo.	16	30	1/2	—	—	0.2	1/300	—	—	—
1 yr.	21	50	1	1.0	1/60	0.2	1/300	0.1	1/600	10
2 yrs.	27	60	1	1.5	1/40	0.3	1/200	0.2	1/300	20
4 yrs.	35	90	2	3.0	1/20	0.4	1/150	0.2	1/300	25
6 yrs.	45	100	2	4.0	1/16	0.4	1/150	0.2	1/300	40
8 yrs.	55	120	2	5.0	1/12	0.4	1/150	0.3	1/200	45
10 yrs.	65	150	3	6.0	1/10	0.4	1/150	0.3	1/200	50
12 yrs.	80	200	3	8.0	1/8	0.4	1/150	0.4	1/150	50

The drug schedule in Table 1 applies to children whose weight exceeds twenty pounds. Ordinarily, no narcotics or barbiturates are given to children under six months of age. The child arrives in the operating suite only moderately sedated, not unconscious.

In certain cases we use rectal Pentothal as a basal anesthetic. We use a ten per cent solution, and we use it at the rate of 20 mgm. per pound of body weight. Rectal Pentothal has its advantages in that it is probably the least traumatic form of induction for the child. However, it is our experi-

that is, adequate and full alveolar ventilation, is essential to the proper conduct of any anesthesia. Depressing respiration with any drug initiates a chain of events that can produce metabolic and endocrine disturbances of such magnitude that the high incidence of cardiac arrest in children is readily understandable.

With the dosage schedule, as illustrated in Table 1, the children are not depressed, so that the anesthesia induction time as well as the emergence time is not prolonged.

Table 1 is a guide to be followed only for average, well-developed pa-

tients. Atropine or scopolamine is to be given to all patients who are to receive anesthesia. Patients who are to receive rectal Pentothal should have atropine or scopolamine, but no narcotic or other barbiturate. All other patients should have morphine or Demerol and atropine or scopolamine plus suppository Nembutal or Seconal. No morphine or barbiturate is to be given to patients under six months of age. Rectal suppositories of Nembutal or Seconal are to be given ninety minutes before operation. Demerol or morphine and atropine or scopolamine are to be given hypodermically sixty minutes before operation.

It has been stated that except for the few cases of overdosage, drug idiosyncrasy and reflex phenomena, cardiac arrest during anesthesia stems primarily from extreme deviations of respiratory physiology. Here is one of the prime differences between the child and the adult. Even though the child possesses a resilient cardiovascular system, there is considerably less margin for error. Careless techniques and methods that are tolerated by the adult produce catastrophe in the child.

Anesthesia Techniques

Several excellent works point out the fact that most anesthesia equipment and most anesthesia methods are intended for adults. Children are an altogether different entity; they are not just small adults. As a consequence some techniques that are highly satisfactory in adults are extremely dangerous in children.

In the field of plastic surgery, neurosurgery, etc., there is often a need for the anesthetist to abandon her traditional position at the head of the table in favor of the surgeon. There should never be any compromise of the child's safety to meet these needs.

Therefore, factors to be considered in determining the anesthetic methods and techniques used are: 1. Size of the infant or child. 2. The location of the operative site (there may be more than one, as in the case of skin grafting procedures). 3. The position of the patient. 4. The anticipated duration of the operation.

The size of the child is important in determining the type of anesthetic apparatus to be used. It cannot be bulky or cumbersome; and in many cases by virtue of the operative procedure, certain techniques cannot be employed because of the space required for their operation.

The operative site is most certainly a deciding factor in the anesthetic approach. Intra-oral surgery indicates an insufflation or endotracheal technique.

The position of the child influences choice of technique, in that the prone position almost always demands endotracheal methods.

The duration of operation may indicate endotracheal anesthesia because of the greater control and efficiency afforded the anesthetist.

Anesthetic Agents

For induction of anesthesia, Vinethene dropped on a four layer gauze mask, with 300 to 500 cc. of oxygen flowed under the mask via a catheter is the method of choice. This is quickly followed by ether and intubation if indicated.

For the last seven months we have used the new nonexplosive agent, Fluothane. We use it with a Fluotec vaporizer on either a Heidbrink or Foregger machine. In this technique we ordinarily flow three liters of nitrous oxide, three liters of oxygen and

no more than two per cent Fluothane. The induction is accomplished with the use of a non-rebreathing mask; and following induction, intubation if necessary is carried out. The patient is maintained on the same flow with ordinarily no more than one per cent Fluothane required for maintenance. I might point out here that we have been very pleased with Fluothane. However, it is essential that one appreciate the potency of this agent; and, therefore, we consider it mandatory that it be used with a vaporizer which possesses the accuracy of the Fluotec unit.

In the older child of two years and more, if there is an accessible vein, an intravenous Pentothal induction is performed. Usually 30 to 60 mgm. is sufficient to produce sleep, and this is followed immediately by 10 to 30 mgm. of succinylcholine (short-acting relaxant) through the same needle. The child is ventilated with 100 per cent oxygen and then intubated. If intubation is not indicated, the Pentothal is followed by open drop ether or an insufflation technique.

Our experience has been that if a child four or five years of age has had in his anesthesia history both an open drop or mask induction and a Pentothal induction, he will on return for additional surgery, invariably ask for the "shot" to put him to sleep. Usually this request is made with one hand firmly clamped over his nose.

We think that in evaluating the psychic trauma associated with the mask methods of inducing anesthesia as compared with the intravenous type, that the latter is far ahead and the more desirable in producing a minimum disturbance to the child's approach to surgery. This is particularly true when the child knows he is returning in the future for more surgery.

For maintenance of anesthesia, ether with high concentrations of oxygen is the agent of choice. Open drop ether with supplemental flow of oxygen under the mask, insufflation, and non-rebreathing endotracheal are the primary methods of choice. Ether is preferred because of its high index of safety, the minute to minute control afforded the anesthetist, and the simplicity of technique it allows.

Perhaps ten years from now my last statement about ether will be obsolete, and perhaps we will all be using Fluothane or some other halogenated hydrocarbon anesthetic; but for now ether is still our most reliable agent.

Two types of anesthesia machines are used, the Foregger Copper Kettle unit and a personal modification of the Richardson Bottle device. Both insure adequate vaporization of ether at a high flow of gases.

A reservoir bag is always incorporated in the endotracheal technique to afford the anesthetist immediate control of respiration if needed.

Experience has shown on numerous occasions that an endotracheal tube is the difference between a smooth, uneventful operation and a nightmare of blood, bucking, coughing and upset tempers. The advantages of an endotracheal technique far outweigh the disadvantages. There is an immediate reduction in the dead space, there is a constant patent airway, and the anesthetist can assist ventilation or even assume full control if the need arises.

The above points are very important in those cases where the anesthetist is away from the patient as in the repair of a cleft palate. Here

the surgeon needs full freedom of movement, and it is in a situation such as this that teamwork is important. The assistant keeps the pharynx clear of blood by proper use of the suction apparatus. The surgeon notes such items as changes in the color of the blood, quantity of blood loss, and in this instance he will be the first to note a return of the swallowing reflex, indicating a lightening of anesthesia.

A point to be stressed here concerns the use of pharyngeal packs. Some foolproof system should be established whereby any and all such packs or sponges are removed at the completion of surgery. Tragic accidents can result if such a procedure is not followed.

Briefly, as pointed out by Smith, the successful conduct of endotracheal anesthesia in children depends on certain prime factors: 1. Use of properly cleaned endotracheal equipment. 2. Use of tubes of the proper size. 3. Avoidance of forceful or hurried intubations. 4. Avoidance of excessive motion of the tube by proper fixation. 5. Use of properly designed laryngoscopes as opposed to the large heavy instruments used in adults.

Strict adherence to the above principles will insure trouble-free endotracheal techniques in pediatric anesthesia.

Two months ago we instituted in our hospital a system of cardiac monitoring on all patients receiving an anesthetic. We use the Veling Monitor developed by Dr. William Veling of our staff and now being produced by the National Cylinder Gas Company. This is a very compact unit weighing less than six ounces and is readily attached to all patients prior to induction. It remains on the patient until he arrives in the recovery room.

In addition to the use of these new electronic cardiac monitors on all our patients, it is mandatory that a stethoscope, equipped with extra-long tubing, be taped to the lateral anterior precordium on all our pediatric patients. In this manner, not only are the heart sounds heard throughout surgery but also the breath sounds of respiration. This method has proved to be of invaluable merit. With brief experience the anesthetist soon learns to correlate changes in what she hears and such occurrences as surgical blood loss, lightening of anesthesia, accumulation of secretions, and so forth. Changes in rhythm are immediately detected; and if a failure in circulation occurs, there is no delay in establishing the presence or absence of a heart beat.

Postoperative Care

In those cases, for example, palatorrhaphy, cheiloplasty, and certain neurosurgical procedures, it is our practice to put down an appropriate sized feeding tube at the completion of surgery. This extra step facilitates postoperative care on the ward and in some cases helps reduce postoperative vomiting, since moderate gastric decompression can be accomplished with these tubes.

Summary

Pediatric anesthesia is of necessity a precise endeavor. Taking advantage of the significant merits of endotracheal techniques allows the anesthetist further control over the anesthetic and patient. It is essential that both anesthetist and surgeon fully understand the need for cooperative team effort. Only by full appreciation of the needs and restrictions present in this type of work, will satisfactory results be achieved.

Current Trends in the Surgical Treatment of Peripheral Arterial Occlusive Disease

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One of the most noteworthy surgical advances during the past ten years has been the successful application of reconstructive technical procedures in the treatment of peripheral arterial occlusive disease. Thanks to the development of better diagnostic methods through angiography, and to the use of serviceable vascular substitutes as well as to the many improvements in the management of operative and postoperative physiological problems, it has become possible to correct many of the ravages of the arteriosclerotic process by means of direct surgical intervention on the involved arteries. Formerly these lesions could be treated only by medical means or by indirect surgical procedures such as sympathectomy, and with very limited success.

The practical feasibility of the use of angioplastic procedures depends on the observation, of relatively recent origin, that the occlusive process caused by arteriosclerosis is often patchy or segmental. In such instances, the surgeon may be able to bridge or repair the occluded arterial segment by an appropriate reconstructive operation. The segmental character of the arteriosclerotic process, however, shows great variations both in the sharpness of localization and in the number and size of arteries involved, a fact that places certain limitations on the scope of the surgeon's use of these new technical methods. In particular, when smaller arteries, say less than 6 millimeters in diameter, are affected with the occlusive process, such direct methods are usually not applicable. Likewise, when the block is located in the terminal portion of an artery without a distal segment suitable for anastomosis, an angioplastic operation is not possible.

As regards the selection of cases that are amenable for angioplastic operations, the surgeon relies heavily on the clinical history and findings. The symptomatology of the surgically amenable types of peripheral arterial occlusive disease is usually quite clear-cut. By far the largest number of patients complain of intermittent claudication. The severity of this symptom varies but its character is unmistakable; no symptoms when at

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rest, muscle pain on exercise, the location of the pain depending on the level of the occlusive lesion, and disappearance of the pain at rest. The only physical finding in such cases is the absence of pulses distal to the level of occlusion, and the limb at rest appears normal. This group of symptoms results from the occlusion of a segment of a major arterial trunk with relatively uninvolved collateral branches that are capable of carrying blood around the occlusion in sufficient amount to supply the needs of the tissues at rest but not quite adequate for the tremendously increased demand during exercise.

When pain at rest is present the compensatory mechanism of the collateral branches is not operative either because of the anatomical pattern of the arterial system, or more commonly, because of the advanced and disseminated type of the pathological involvement. That is to say, in the latter instances there are no arterial branches present that would take over at least part of the function of the obstructed arterial trunk. This degree of disease usually progresses to pregangrenous and finally to gangrenous changes. Experience has shown that the type of arterial disease whose principal manifestation is intermittent claudication—that is, muscular pain or discomfort on exercise—is often technically well suited for reconstructive surgical correction while the type with rest pain and pregangrenous changes frequently cannot be so treated successfully.

While the surgeon can make an accurate diagnosis of the type of arterial occlusive disease he is dealing with on grounds of the historical and physical findings in the large majority of instances, in deciding on the appropriate surgical procedure to be used he needs the information supplied by angiography. This method of examination consists, in essence, in the roentgen visualization of the arterial trunk through the injection by the appropriate technique of a contrast medium. A detailed image of the arterial system can thus be obtained with a good definition of the extent of the occlusive disease. A decision can then be made whether the lesion is capable of surgical correction, and a method chosen for achieving the correction. Space does not permit discussion of this method in detail but it should be emphasized that lumbar aortography, and, to a lesser degree, femoral arteriography, is a potentially dangerous procedure. It must be regarded as a major operation and performed only by surgeons who have been specially trained in its technique.

The mere presence of an occlusive arterial lesion, even if symptomatic, is not an indication for angioplastic therapy. The criteria of surgeons in recommending this type of treatment vary somewhat but there is fairly general agreement that patients whose symptoms of intermittent claudication are of a trivial degree and those with a long and insidious history of rest pain ending in gangrene, are not good subjects for this type of management. In the first group the degree of disease does not justify operative intervention, in the latter, reconstructive surgery has nothing to offer.

There is a significant number of patients, however, with early gangrene of sudden onset for whom an angioplastic operation may be very successful. Likewise, these operative procedures have given excellent results in cases with intermittent claudication of such degree as to interfere with the patient's livelihood or mode of living. Also many patients whose

main symptom is rest pain but who have not yet reached the stage of gangrene often greatly benefit from these operations. As said before, in every individual case the surgeon's final decision about the indications for operation, no matter how favorable the circumstances may appear clinically, must rest on the findings of the angiographic examination. Obviously, if a patient with arteriosclerotic occlusion of the limbs also suffers from other serious manifestations of arteriosclerosis, such as coronary or cerebral arterial thrombosis or renal disease, the surgeon will not recommend an angioplastic operation.

The technical variants of angioplastic surgery are many but they all can be included under two main headings: thrombo-endarteriectomy and arterial grafting. In thrombo-endarteriectomy the occlusive thickening of the intima is removed by dissection in the tissue planes of the arterial wall; in popular parlance this procedure has been called "reaming out" the artery. Arterial grafting has for its aim the insertion of a new vascular channel either completely replacing the diseased arterial segment or going around it.

Thrombo-endarteriectomy is the older procedure (it was introduced about ten years ago), and after an initial popularity it fell into a temporary disrepute. The cause of this disrepute was that, when used for the treatment of all types of occlusive lesions, including those in the smaller arteries, the results of this operation proved to be considerably inferior to those of grafting procedures. At present most surgeons agree that thrombo-endarteriectomy is difficult to perform successfully for the treatment of the disease of smaller arteries but in the larger arteries it gives very satisfactory results.

Arterial grafting had its origin about six years ago and its history has been somewhat the reverse of that of thrombo-endarteriectomy. The early results were brilliant but as time went on an unexpected number of the successful cases had recurrences. These late failures were partly due to the progression of the original disease and partly due to the degeneration of some of the grafts that had been used, grafts that early in the history of the operation were almost without exception of the homologous arterial type.

These experiences have gradually led to an attitude regarding the use of these two types of angioplastic procedures that may be called a compromise. At present most surgeons use both methods, attempting to fit the operative technique to the needs of the individual case.

Another important change that has recently taken place in the use of reconstructive arterial surgery has been the abandonment of the use of homologous arterial grafts. A number of artificial arterial substitutes have been developed that are made of plastic fibers and that have not only given results comparable to those of homografts, but promise to last much longer.

In our practice we use exclusively a prosthesis woven of specially processed Dacron fibers that have an elastic quality. This prosthesis is smooth-walled, light, can elongate and recoil, and in animal experiments has shown almost unlimited staying power.

While there is good agreement on the general value of the two main types of reconstructive surgical methods, surgeons vary somewhat regarding their preference for the variant

of technical procedure to be used in dealing with a given problem. The following brief statements describe the practices at the Henry Ford Hospital.

Thrombo-endarteriectomy is the preferred operation for the treatment of aorto-iliac occlusive disease when the occlusive process does not extend beyond the division of the common iliac artery. We have learned that extending the removal of the lesion into the smaller divisions of the common iliac artery, namely into the femoral region, creates serious technical complications and reduces the success rate. In the femoral arterial trunk we use thrombo-endarteriectomy only if the lesion is very short (less than 5 cm.) and is bordered by unaffected arterial segments.

Among the grafting operations, a technique named bypass grafting has come to be by far the most commonly used. As briefly described before, the technical principle of this procedure is to insert a new pathway from the most nearly normal arterial segment above the occlusive lesion to a similar segment below the lesion. The involved artery is disturbed in the least possible degree. The advantages of this technique are important: it leaves all or most of the functioning collateral arteries undisturbed, it simplifies the dissection and, as a result of the reduced amount of surgical trauma, lessens the risk of the operation. From the point of view of blood flow, this operation is not quite so efficient as the complete replacement of the diseased artery, but this difference in practice is negligible. Bypass grafting has shown its advantages most clearly in recent years in cases of more advanced and rather diffuse types of arterial disease occurring in older patients, of whom the vascular surgeon sees a steadily increasing number.

Bypass grafting can be used in all necessary anatomical locations from the aorta to the femoral artery, from the iliac artery to the femoral artery or from any of these points to the popliteal artery. The bypass may be unilateral or bilateral at any of these levels. Because of the advantages of bypass grafting, the operation of excision and replacement of the diseased artery is seldom done. We use it when, in aorto-iliac occlusive disease, the aorta is severely diseased and thrombo-endarteriectomy is not feasible. Under these circumstances the excision of the distal aorta and some length of the common iliac arteries has certain technical advantages.

When one wishes to make an assessment of the value of these operations, he finds the task rather complex. There is no doubt that the results in terms of salvage of extremities and earning power and of alleviation of pain have been most worthwhile. Up to three years following operation, about 80 per cent of the patients with aorto-iliac and about 60 per cent of the patients with femoro-popliteal involvement show excellent results. Unfortunately, after longer periods of observation, the success rate gradually and steadily falls off. It is hard to tell how much more permanent the results can be made through improved operative techniques. Arteriosclerosis is a progressive disease and, at the present stage of our understanding, incurable. The surgeon manfully struggles to repair the grosser harm wrought by it but he cannot conquer it. Indeed, the ultimate conquest lies far in the future and it will be by means other than surgical. In the meantime, many limbs will be saved, much suffering spared, and lives kept useful by the angioplastic operations we have briefly surveyed.

The Community is your Patient

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The subject assigned is quite a broad one — in fact, it encompasses the world. In today's jet age no thinking person can limit his definition of community by the narrow confines of the state or even the country in which he lives. Our community today is the whole world. An action of a single individual in the United States can trigger comment and demonstration in countries around the globe. Today's headlines verify that fact. In some respects this is a frightening and sobering thought. However, viewed thoughtfully and objectively, there is a bright promise offered us as a nation and as individuals if we are willing to pay the price — that promise is for peace.

The achievement of good human relations the world over is one of man's most pressing problems. Its solution would bring joy and happiness to the hearts of people everywhere and peace to a troubled world. Success or failure will depend upon the effectiveness of the human equation—practiced by each of us each day that we live. Perhaps you are thinking, what does all that have to do with me or with the subject? I will tell you. Human relations in one form or another are with us always. They are a vital part of everything we do.

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Presented at the annual meeting, Texas Association of Nurse Anesthetists, Dallas, May 12, 1960.

In your profession you can go anywhere in the world and find a need for your skills. I hear every day about nurses who spend a year or two in one country and then another—working all the while. Last year during the celebration of the 50th Anniversary of our own School of Nursing we thrilled to receive messages from graduates who are serving in practically every country in the world except Russia — some in the armed forces and others in the mission fields.

Whether you are working in Dallas, Texas, or in a distant land, if you are to be successful and happy as an individual you must realize an important fact — "the human equation is the most important of all success factors." It is the factor which will determine your success or failure with your patient — the community.

In a recent Gallup poll of public opinion, a list of professions — fourteen in all — was handed to a group of persons conducting a survey. They were asked, "Suppose a young girl came to you and asked your advice about taking up a profession. Assuming that she was qualified to enter any of these professions, which one of them would you first recommend? It is significant to note that 33% of these people voted for the nursing profession. Isn't that an interesting

fact? It is a fine tribute to our modern society when the Gallup poll names "nursing" as the top profession for women! And, at a time when many disillusioned people are claiming that kindness and feeling for humanity are rapidly disappearing, 33% of our people would choose nursing as a profession for women! There is no profession which requires more kindness, consideration, and patience with humanity than that of nursing. Therefore, the people's choice is a commendable one.

The nursing profession strongly merits and should have public approval. It has much of which to be proud. Only a few other groups dedicate themselves to such high ideals and action. Nurses, wherever they may be, know these facts to be true. But what does the community really know about nurses? This is the message you must tell — in your day-to-day contacts with the community.

There is no shortcut — no easy effortless way to good public relations for any profession. Therefore, I would like to suggest a few areas of thought which I believe may favorably influence your patient — the community. Let me begin with *you*. Take a look at yourself and ask this question — what is my attitude toward my profession? You must answer the question honestly before you can hope to succeed because your attitude makes the difference. Is your attitude that of the one who penned these lines, "Breathes there a man with soul so dead who never to himself hath said: 'There must be a better way to make a living than this?' " Or — do you honestly believe the nursing profession is the best profession in the whole world? And — do your actions testify to this belief?

No one has ever found a substitute for the human touch in winning success and happiness. Dr. Spencer M. Free of Dubois, Pennsylvania, wrote this verse on that subject.

"'Tis the human touch in this world that counts;
The touch of your hand and mine.
Which means far more to the fainting heart
Than shelter, bread and wine.
For shelter is gone when the night is o'er
And bread lasts only a day,
But the touch of the hand and the sound of the voice
Sings on in the heart always."

You must study people, how to understand them and how to persuade them. The one who is most expert in human relations never rejects anyone's ideas or throws cold water on someone's plan. He listens with interest, and finds much to commend.

You must sincerely try to understand and to encourage everyone with whom you come in contact. People who understand each other never fight. Encouraging others will make them your friends.

Joyce Mayhew, a talented San Francisco writer said, "The human touch is a simple thing — but it is what sets man apart from all lower forms of life". It pays to cultivate good human relations even with those you may never see again.

People are really easy to please and to win—all it takes is an alertness for the opportunity to please them and a willingness to do it at every opportunity. When one becomes bitter and sour and begins to think everyone is against him, he will begin to treat them accordingly—and they soon will be against him. But let one think and act as though everyone is a friend,

and unconsciously he will begin to treat them so—and they will soon be friends.

James T. Mangan — a Chicago writer, expressed it this way — "Deliver what you demand". When it comes to other people satisfying you, you demand an awful lot—perfection is what you demand — but what do you deliver?" In food service we demand what we like — in listening to a sermon we are often critical, when making a purchase we demand the ultimate in service. Yet, what do we give when we are trying to satisfy others?

Your start in acquiring the proper human touch begins with a change of attitude. Your attitude toward others will have to be right. You are going to have to develop a genuine interest in and liking for people. Train yourself to have adventure and fun in the people you have around you every day. You can be happy if you try. "Happiness is that peculiar sensation you acquire when you are too busy to be miserable."

Develop appreciation. The finest, most gracious and most profitable of all human arts is the art of appreciation. Everyone in the world hungers to be appreciated and everyone yields to the one who appreciates him. A capsule course in appreciation is expressed in these terms:

Five Most Important Words — *I AM PROUD OF YOU!*

Four Most Important Words — *WHAT IS YOUR OPINION?*

Three Most Important Words — *IF YOU PLEASE!*

Two Most Important Words — *THANK YOU!*

Least Important Word — *"I"*.

How often we overwork this least important word.

Elmo Roper, a New York marketing consultant, made a survey in New York to measure the public's reaction to hospitals. The survey showed that among the 42% who did criticize, the primary complaint was that hospital personnel were rude, inattentive and inconsiderate. People have great admiration for the hospital's technical facilities and performance but feel that the human side of hospital care is frequently neglected. The most important part of an effective public relations endeavor is a genuine regard for the public's interest. It is not money or high-pressure publicity, but the little acts of thoughtfulness that prove hospital personnel like the community and want to merit its approval and respect.

The entire secret of your success and happiness day by day is determined largely by your ability to get along with, influence, inspire and change other people and many of these people are the ones who see you and work with you day after day. Before you can serve the patient adequately you have to make an investment in understanding which involves the hospital team—those with whom you work. The Bureau of Vocational Guidance at Harvard University made a study of thousands of men and women who had been fired and they found for every person who lost his job for failure to do the work, two persons lost their jobs for failure to deal successfully with other people. On the other hand, those who are most successful and enjoy life the most are those who have "a way with other people." This includes all the people on the team, even those you may not like.

It is told that Jefferson Davis, then

president of the Confederacy, once asked General Robert E. Lee his opinion of a brother officer and the General praised him in high terms. Another officer, standing nearby, said in astonishment, "General, don't you know that man is one of your enemies and never misses a chance to malign you?" "Yes," replied the great leader, "but the President asked me for my opinion of *him* — not for his opinion of *me*."

On the job, — and for the sake of the job,—it is most desirable that we make every effort to cooperate and "get along" with three kinds of folks:

1. The folks we *like*
2. The folks we *don't* like
3. The folks who don't *like us*. *Cooperation* makes everything easier for everyone.

We are all beset with everyday worries but to be successful we must leave those worries at home. As one expressed it — "Worry pulls tomorrow's cloud over today's sunshine". Don't be a fault finder—there are no rewards offered for that. The person who is always up in the air harping on something isn't necessarily an angel. And remember — running people down is a bad habit too. Did you ever wonder why some people are so dissatisfied with everybody else—and so satisfied with themselves? Are you one of those? If you rebuke, do it with a smile. Don't be foolish and tell someone where to get off. Be wise and try and suggest where they can get back on. Many times co-workers explode over some incident and are immediately sorry. They would be grateful for an opportunity to clear the atmosphere. If you would be adept in human relations, give them that opportunity.

No one likes the person who is always telling their troubles. Are you guilty of this offense?

"The world, you advise me, is utterly wrong
Your life, you assure me, is sad
Whenever we meet, you are there with a long
Sad tale of the trouble you've had.
Your rent has been raised and you think it's unfair
You're losing your money, your mind and your hair,
That luck is against you, my friend, I can see
You have reason, I grant to be blue,
But why must you tell all your troubles to me
When I'm dying to tell mine to you?

Your mannerisms can often give others w r o n g impressions. Always hold your head up, but be careful to keep your nose at a friendly level. Be tactful. A story in point is that told of a Southern lady who had entertained friends at dinner. The biscuits when served were hard as nails. After the guests had departed she called in her maid and asked, "Amanda, what did you need for the biscuits this evening that you didn't have?"

You must have a sense of humor. It is, without doubt one of the most valuable of all assets in dealing with people. It isn't your position that makes you happy or unhappy—it is your disposition. Learn to laugh at yourself and see the funny side of what otherwise seems a difficult situation. An excellent authority tells us "laughter is m e d i c i n e to weary bones". Another says, "humor is the oil that lubricates the wheels of life and helps to keep it running smoothly." However defined, it is an absolute must for happiness.

Criticism will get you nowhere and it will make you extremely unpopular. You are acquainted with the type

of person who has only one point of view — his own.

For example: When the other fellow takes a long time to do something, he's slow. But when I take a long time to do something, I'm thorough.

When the other fellow doesn't do it, he's too lazy. But when I don't do it, I'm too busy.

When the other fellow goes ahead and does something without being told, he's overstepping his bounds. But when I go ahead and do something without being told, that's initiative!

When the other fellow states his side of a question strongly, he's bull-headed. But when I state my side of the question strongly, I'm being firm.

When the other fellow overlooks a few rules of etiquette, he's rude. But when I skip a few of the rules, I'm original.

When the other fellow does something that pleases the boss, he's polishing the brass. But when I do something that pleases the boss, that's cooperation.

When the other fellow gets ahead, he sure had the lucky breaks. But when I manage to get ahead, Man! Hard work did that!

Funny, isn't it — or is it!

Remember to smile. Everyone smiles in the same language. And although a smile is contagious it is one disease to which the Board of Health doesn't object. Another has said, "A smile is a light in the window of the face that shows the heart is at home."

Don't get in a rut. Many individuals fail to do their best. They do just enough to get by — nothing more — and have no desire for self-improvement. A young salesman in attempting to sell a book on farming to a farmer met with a refusal. Asked why he didn't want the book the farmer replied, "I don't need it". The young man said, "Oh sir, every farmer needs this book to help improve his farming methods and raise more diversified crops". The farmer replied, "Well I don't need that book because I ain't farmin' as well as I know how, now!"

Kindness often means more to the patient than do drugs and routine hospital care so necessary to his getting well. There is something about pain and illness that makes a human being sharply aware of every remark made by those about him. Every impression not only registers completely —but lastingly, and is driven deep by the impact of anxiety. Thoughtless talk can provoke justified anxieties for the patient. Some patients are hesitant to ask for even vital needs, especially if the staff remarks it has been a hectic day, or indicates without words their impatience with someone's request for services.

Don't ever plead age as an excuse —even if you are beyond the sunny side of forty. Youth is not a time of life — it is a state of mind. Oliver Wendell Holmes said, "To be 70 years young is sometimes far more cheerful and hopeful than to be forty years old." Nobody grows old by merely living a number of years; people grow old only by deserting their ideals. I agree with Charles Dickens who said, "No one is useless who lightens the burdens of another," and one can do that regardless of age.

The term "well-adjusted" has become so common that we see or hear it almost every day. Many of us make liberal use of it in discussing our friends and their problems. The psychologists, from whom we borrowed the term, have more definite ideas on the subject. Those ideas, translated into non-technical terms, draw this picture of the well-adjusted individual: 1. He is a person who knows a lot about himself, and he generally likes what he knows, or at least is willing to accept it. 2. He is genuinely interested in other people. 3. He is able to get a job done without having to resort to threats or coercion. 4. He may become angry or irritated, but usually with apparent reason, and he expresses his anger in an acceptable

manner. He does not carry a grudge. 5. Last, but most important of all, he is capable of love that places emphasis on the giving.

I read a book not long ago entitled, "The World is Learning Compassion". As I read it I was reminded of the great need for that rare human quality in our everyday life. Nursing is not an easy road to travel; it produces both physical and mental fatigue. It is difficult in many ways and impossible for those who lack that special something inside that caused them to choose this vocation above all others—a love and compassion for men and women who need care. There is no blueprint or published public relations technique for human compassion — yet there is nothing more reassuring to a patient or his family.

This true story told by a hospital administrator illustrates that fact. The husband of a patient came to his office and said there was no place on the patient questionnaire to write what he and his wife would like to say. The husband then told how a nurse had come to his wife's room late one night just before going off duty to see if the patient was comfortable and whether or not there was anything his wife wanted before she left. The wife was terribly worried and distraught about many things and started to sob as the nurse came in. The nurse, sensing the situation, took his wife in her arms, held her tightly for a few moments and patted her reassuringly until she was quiet again. That little expression of understanding and sympathy, he said, did more to help his wife and to guide her over rough spots to follow than any medicine the doctor could have prescribed. He just wanted the administrator to know that he was sure there was nothing in the hospital rules which told the nurse to do that, but he thanked God there were nurses like her taking care of the sick.

In any profession one must learn how to continue to do his best frequently without apparent appreciation. Many times the very best things you do may go unnoticed and unappreciated. That's life — my friends! Some people have to die before they are appreciated. A minister tells this story which illustrates the point. He said shortly after he became minister of a church in Massachusetts, a reception was given for a former minister of the church. Because the former minister was being appreciatively received and the new one rather noticeably neglected, a dear old lady approached the new minister and said —"Reverend Jones—we will like you just as much after you are gone as we do Reverend Brown." Are you faced with the problem of how to live without appreciation, recognition, or praise? Well — I have news for you. The problem will never be solved for you until you cease to expect appreciation.

Modern psychology tells us that people who are forever seeking and expecting praise are still childishly immature — they haven't grown up. Usually people do not see, recognize or appreciate the things you consider the most important. Any person in public life knows this only too well. William Jennings Bryan said that upon a certain occasion when he was making a speech he was greatly impressed by the attention of a certain man in the audience. The man sat a few rows from the front and as the speech went on he seemed to grow more and more absorbed. He hung upon the speaker's words. Mr. Bryan said he felt so flattered that he found

himself watching his admirer more and more closely until finally he was aware that he was addressing himself to that one man, oblivious to the rest of the audience. Later in the evening the man came upon the platform, watched his chance and grasped Mr. B r y a n ' s hand. He said, "I have watched you every minute; I have never taken my eyes off your face." He was so eager and enthusiastic that Mr. Bryan felt thrilled, for here was real appreciation. The man continued —"I am a dentist, and never before in my whole professional career have I seen a speaker who, when he laughs, shows both rows of teeth all the way around." So—you see—what you and I consider most important in life usually is the least recognized.

Many people seeking appreciation worry themselves into n a m e l e s s graves, whereas a few unselfish souls, content to do well the task at hand, forget themselves into immortality. Probably the most inseparable pair of women who ever lived were Helen Keller and Anne Sullivan Macy. For 50 years Mrs. Macy gave herself with selfless devotion to Helen Keller. One night when they came to Denver on a tour, Helen Keller stood on the stage, and held her fingertips on the violin of a great master, while he played, "Ah Sweet Mystery of Life." She turned to the audience when the music was concluded and said—with tears flowing from her blind eyes—"I have found life so beautiful." Back in the shadows—out of the spotlight — getting none of the applause — wanting none of it—stood little Mrs. Macy — who had made life just that for Helen Keller.

May I submit for your consideration this short guide to good human relations: 1. Speak to people. There isn't anything as nice as a cheerful word of greeting. 2. Smile at people. It takes 72 muscles to frown, but only 14 to smile. 3. Call people by name. The sweetest music to anyone's ears is the sound of his own name. 4. Be friendly and helpful. If you would have friends, be friendly. 5. Be cordial. Speak and act as if everything you do is a genuine pleasure. 6. Be truly interested in people. You can like anybody if you really try. 7. Be generous with praise—cautious with criticism. 8. Be considerate of the feelings of others. It will be appreciated. 9. Be thoughtful of the opinions of others. There are three sides to a controversy . . . yours, the other fellow's and the right one. 10. Be alert to give service. What counts most in life is what we do for others.

The building of good human relations is an age-old problem which has plagued mankind since the dawn of civilization. Good human relations, w h e t h e r worldwide or local, are founded upon faith in, and respect for, the rights and freedom of others — upon faith in God, ourselves and our fellowmen.

Bad h u m a n relations thrive on doubt and fear, suspicion and distrust, greed, and selfishness and indifference to the rights and freedoms of others. In the book, "Russia, the Utopia in Chains," I read this startling statement which epitomizes the Communistic philosophy that threatens to engulf our world today: *"We hate Christianity and Christians. Even the best of them must be regarded as our worst enemies. They preach love of one's neighbors and pity, which is contrary to our principles. Christian love is a hindrance to the development of the revolution. Down with the love of one's neighbors. What we want is hatred. We*

must know how to hate, for only at this price can we conquer the universe. The anti-religious campaign must not be restricted to Russia; it should be carried on throughout the world." In answer to this challenge I say to you now in all earnestness—grow a great soul full of love for God and your fellowman.

I recently heard a well-informed person say that statistics reveal as a positive fact that from a review of the success stories of many eminent people in the United States that their success was due 20% to ability and 80% to personality. Taking that as my cue I have tried to point out a few of the attributes I think you as a nurse must possess or develop if you are to meet with success and be favorably accepted by your patient—the community. I have found from my own experience that the secret of happiness lies not in doing what one likes—but in liking what one is doing. In all sincerity, I say to you the community is a better place because nurses are a vital part of it. A patient, and I am sure he speaks for the majority of your patients, gave his definition of a nurse: I leave you with its message, a tribute to nursing, which I wholeheartedly endorse:

How a Layman Defines a Nurse

A nurse is: the gentle touch that soothes a fevered brow, a kindly beacon in the fog of delirium, a wise and knowing hand that transforms anguish into blessed sleep!

A nurse has: arms that can tenderly cradle a newborn child, or give supporting comfort to a wounded soldier far from home; the resolute voice of youth, when first she proudly repeats the pledge of Florence Nightingale, and vibrant tones that take on added richness with the maturity of years.

Her beauty is: the true beauty that stems from an inner loveliness of spirit.

The language she speaks is: a universal language that knows no barriers of nationality or tongue.

A nurse is: a quick step in a dim corridor at night; a crisp silhouette of hope, as the ambulance sirens wail; the quiet competence that dispels hysteria and panic in the sickroom; the watchful sentinel through the long vigil when the spark of life is low.

Her's are: the swift, sure movements of the trained technician in the operating room, and a resourceful ingenuity pitted against the elements in the disaster area.

A nurse is: a delicate combination of skills and trained intuition, ministering to the spiritual needs of those in her care, knowing the interdependence of spiritual well-being and physical recovery and the *balance* between scientific skills and the benevolence of the Divine Healer.

Untiring in her zeal, unwavering in purpose, and firm in the exercise of her duties, the *nurse encourages* her patient, step by step, along the road to recovery—or, if God ordains, to a happy reunion with Him in the life beyond.

A nurse is: the dedicated embodiment of God's own concept of mercy.

Insurance

Read and Think!

Problem Number 1

It is a fact that someone becomes a hospital patient, on the average of about every 1.3 seconds! On an average day there are more than 1,363,000 patients in U. S. Hospitals! One person out of every seven becomes a hospital patient in a year's time! The cost for Hospital Care for 1959 was 268% more than the average for 1946![1]

Solution

In all of 1959, health insurance benefits amounted to $5,175,000,000.[2] About 26% more people were insured through a Major Health Care Plan than in 1958. *Members of the AANA who received benefits through their Group Major Hospital Plan are included in the national figure.*

Problem Number 2

In the average year one out of seven men and *one out of 3 women are disabled over 8 days* — One sickness in 5 lasts over 4 weeks and one sickness in *15* lasts over 2 months or more. Two disabling injuries in every 5 happen in the home. This represents an economic loss of $12,600,000,000 a year.[3]

Solution

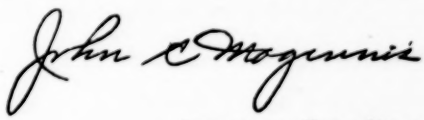
Insurance companies cash benefits paid to "loss of time" policyholders amounts to $838,000,000[2] during 1959. *Included in the amount are the cash benefits to AANA members insured through their group "Insurance Protection Plan".*

Problem Number 3

It is a fact that out of 20 women (note — statistics on men are less favorable) who reach age 65, only 3 will have some financial security; only 4 will be able to live comfortably and 13 (or 65%) will have only Social Security! The amount of money spent to support these old people through various charities (homes, State Institutions, relatives and friends) is too astronomical to ascertain.

Solution

The development of various Group Retirement Plans over the past few years will not only assist the retired person but also greatly relieve the financial burden of the various charitable channels. The Group Retirement Plan designed entirely for members of the AANA will protect the AANA member and thereby contribute to the national problem.



Insurance Consultant

[1] AHA Report
[2] Health Insurance Institute Report
[3] U. S. Government and other authoritative sources

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The "Financial Security Program" designed for members of the AANA

Will answer most of the financial problems caused by

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— Hospital Bills

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See—"READ & THINK" (page 359) then complete the coupon below for full information.

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☐ Retirement (note — please give birth date on request for Retirement)

☐ Major Hospital

Birth date _____

Name _____

Address _____

City _____ State _____

Legislation

Emanuel Hayt, LLB., Counsel A.A.N.A.

Judgment Upheld for Anesthesia Death by Employed Resident as Extension of Hospital Liability in Ohio

Plaintiff's decedent, on the advice of his own doctor, was admitted to the defendant hospital for an operation for a perirectal abscess to be performed under a general anesthetic. In addition to the operating room facilities, the defendant furnished anesthesia equipment and the anesthetist who was a resident physician on the staff of the hospital. Plaintiff's decedent died four days after the operation as a result of the alleged negligence of the anesthetist in inadequately anesthetizing the patient. A wrongful death action resulted in a judgment for plaintiff.

The anesthetist in this case was a graduate of the University of Rome, Italy, and at the time he administered the anesthetic to plaintiff's decedent was licensed to practice medicine in Italy but not in Ohio. He had first been employed by the defendant as an intern. At the time of his alleged negligent acts, he was a resident in anesthesia on the staff of the defendant.

Since the anesthetist was not licensed as a physician in Ohio at the time of the acts complained of, it would be possible to consider him as any other nonmedical employee and avoid the problems hereinafter listed. However, in order to meet head on a problem which has been inevitable since the decision in Avellone v. St. John's Hospital, 165 Ohio St., 467, 135 N.E. (2d), 410.

The Court held that the hospital is legally accountable to the plaintiff for the negligent acts of one who was employed by the hospital as a "resident in anesthesia."

In the Avellone case, supra (165 Ohio St., 467), this court held that a corporation not for profit, which has for its purpose the maintenance and operation of a hospital, is, under the doctrine of respondeat superior, liable for the torts of its servants. Specifically reserved from that decision, however, was the question whether "persons working in a hospital, such as doctors and nurses, *under circumstances where the hospital has no authority or right of control over them,* can bind the hospital by their negligent actions."

"The nature of the act done, whether it is administrative or medical, cannot justify a difference in the legal theory of liability. The test should be, simply, was the act done performed in the service of the employer and was the act done in the scope and course of the employee's duties. Obviously, such a test, will so far as a hospital is concerned, relieve from, or subject to, liability in exactly the same manner and according to the same rules as any other employer is relieved or subjected."

Judgment for the plaintiff was affirmed.

(Klema v. St. Elizabeth's Hospital of Youngstown, 166 N.E.-2d, 765—Ohio)

The books listed in the Anesthesia Section of our new 1960-61 Catalog of over 1250 books. (Send for a copy today.)

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☐ Schneck—**HYPNOSIS IN MODERN MEDICINE** (2nd Ed.). Pub. '59, 400 pp., $8.75

☐ Seward & Bryce-Smith — **INHALATION ANALGESIA IN CHILDBIRTH.** Pub. '57, 64 pp., 10 il., $1.50

☐ Stephen — **ELEMENTS OF PEDIATRIC ANESTHESIA.** Pub. '54, 128 pp., 25 il. (Amer. Lec. Anesthesiology), $3.50

☐ Virtue—**HYPOTHERMIC ANESTHESIA.** Pub. '55, 80 pp., 2 il. (Amer. Lec. Anesthesiology), $2.50

☐ Walker & Turnbull—**OXYGEN SUPPLY TO THE HUMAN FETUS.** Pub. '59, 346 pp., 137 il., $10.50

☐ Young—**FIRST AID AND RESUSCITATION.** Pub. '54, 352 pp., 168 il., $8.50

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Book Reviews

CARDIAC RESUSCITATION. By J. Willis Hurst, M.D., Professor and Chairman, Department of Medicine, Emory University School of Medicine, Atlanta, Georgia. Charles C Thomas, Springfield, Illinois. Cloth. 141 pages. 1960. $5.50.

Originally prepared as a symposium designed by the Department of Medicine of Emory University School of Medicine, Atlanta, Georgia, the present text is made up of the records of that discussion. The notes were later revised and edited by the participants in preparing the manuscript. In addition to a thorough discussion of cardiac resuscitation, there are chapters on respiratory resuscitation, the role of cardiac drugs and errors in cardiac arrest, and the viewpoints of a lawyer and a theologian. Bibliographic references follow each chapter. The book is well indexed.

PHARMACOLOGY OF ANESTHETIC DRUGS. A Syllabus for Students and Clinicians. By John Adriani, M.D., Director, Department of Anesthesiology, Charity Hospital, New Orleans, Louisiana; Professor of Surgery, Tulane University School of Medicine; Clinical Professor of Surgery and Pharmacology, Louisiana State University School of Medicine; Professor of General Anesthesia, Loyola University School of Dentistry, New Orleans, Louisiana. Charles C Thomas, Publisher, Springfield. Cloth. 232 pages, indexed. 4th ed., rev. 1960. $11.00.

The fourth edition of this popular book appears eight years after the third edition. With the addition of many new compounds available to anesthetists, entire new sections have been added to the book. Older drugs, which have been studied in more detail, are presented with corrections and additions based on recent studies.

Emphasis has been placed on the use of many drugs in anesthesia. The form of presentation remains the same as in the earlier volumes, outlining fundamentals. In addition to the anesthetic drugs, some consideration is given to methods and considerable space to the adjunctive drugs. An extensive list of references, both general and specific, is included as well as tables, a glossary, and an index.

PHARMACOLOGY IN NURSING. By Elsie E. Krug, R.N., M.A., Instructor in Pharmacology and Anatomy and Physiology, Saint Mary's School of Nursing, Rochester, Minnesota. C. V. Mosby Company, St. Louis. Cloth. 805 pages. Indexed. 8th ed., 1960. $6.00.

Prepared for the use of student and graduate nurses, this eighth edition has been completely revised to include newer drugs that had been added since publication of the seventh edition in 1955. The metric system has been used in keeping with the modern teaching trends. The apothecary system dosages are used in addition for drugs that are commonly prescribed using this method. Anesthetic methods and agents are included in this large text.

Abstracts

Fields, J. A.: Injuries and sequelae associated with endotracheal anesthesia. Laryngoscope 69: 509-518 (May) 1959.

"An ever increasing sense of awareness of the possible sequelae of endotracheal anesthesia has been manifest during the past decade. . . . The undesirable effects of intubation should be divided into those caused by, 1. inexpert use of the laryngoscope; 2. traumatic passage of the endotracheal tube; 3. the presence of the tube itself in the air passages. . . . Training in laryngoscopy should be stressed among anesthesiologists. . . . It is speculated that removal of the mucosa covering the junction of the membranous vocal cord and the arytenoid are not, in themselves, responsible for granuloma formation, but that there is needed in addition the hammer and anvil action of vocal abuse to forge these lesions."

Theye, R. A. and Fowler, W. S.: Carbon dioxide balance during thoracic surgery. J. Appl. Physiol. 14: 552-556 (July) 1959.

"A difference of opinion exists concerning the ventilatory requirements for the adequate removal of carbon dioxide from anesthetized man during intrathoracic surgery. . . . Although the lateral position and open pneumothorax have been implicated repeatedly in explanations of apparent changes in the ventilatory requirements during intrathoracic surgery, definitive published data that support or contradict the allegations are scanty. The results of the experimental study reported herein suggest that the ventilatory requirements of anesthetized dogs are not greatly influenced by effects of lateral position, open pneumothorax, or small right-to-left shunts on the ventilatory removal of CO_2, but are determined principally by metabolic production of CO_2 and the degree to which the ventilation is distributed to perfused alveoli. . . .

"Anesthesia was induced in 28 dogs . . . with a single i.v. injection of pentobarbital . . . or Dial . . . with urethane. . . . In order to minimize the effect on metabolism of variation in the level of anesthesia, anesthetic drugs were not employed further. . . . A constant, slow drip of succinylcholine . . . was injected via a small catheter in a femoral vein. Over the 6 or 7 hours of the procedure, approximately 500 mg. of succinylcholine and 500 cc. of 0.9% saline were administered. . . .

"The adequacy of ventilation may be properly assessed in some situations by measurement of expired alveolar PCO_2. However, it should be noted that during thoracic surgical procedures situations may exist in which the level or direction of change of end-expiratory PCO_2 is not representative of tissue changes."

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Hospital Safety

Harriet L. Aberg, C.R.N.A.

The crisp, cool days of autumn and winter are high static days in the northern part of our temperate zone when low humidity prevails. This reminds us to ask:— Are all persons, furniture, equipment and such in electrical contact with each other so that differences in electric charge are not possible? (Most easily accomplished through conductive floors.) If all persons and things are of the same electric charge, then making and breaking contact in the anesthetist's hazardous area will not cause static sparking.

This brings us once again to the points or areas of electrical contact. Is the patient connected "by a conductive strap in contact with the patient's skin with one end of the strap fastened to the metal frame of an operating table"[1] and the operating table electrically connected to the conductive floor through conductive casters? Are all personnel connected to the floor by means of conductive soled shoes? Are the shoes tested daily on the wearer to ensure conductivity? Are shoe soles, conductive casters and other electrical contact devices properly maintained so dust, lint, oil, wax, etc. do not form insulation? Is all clothing of a type material which will not hold an electric charge on its surface? Is the humidity kept at 50% or more which helps keep slip and uniform skirts which are not in contact with the skin at their maximum safety? All these things are necessary for patient and personnel safety wherever flammable anesthetics are used.

Many hospitals have safety committees who make plans for actions in case of fire or other disaster. Fires can occur in operating rooms and delivery rooms. Are we, as anesthetists and key persons, making plans for our patients and ourselves in case fire strikes? Do we know how to direct the moving of our patients and equipment if evacuation is necessary in the midst of surgery? Have we looked around to see where we would move to? This last question is frequently the bottleneck question.

Evacuation plans in case of fire have been made with infinite care in many institutions so that patients and personnel can be moved out of a dangerous smoke or fire area. But where is the patient, operating team and equipment to go to finish surgery?

(Continued on page 376)

[1] N.F.P.A. #56, "Code for Use of Flammable Anesthetics".

Miss Aberg is A.A.N.A.'s representative on the N.F.P.A. Committee on Hospital Operating Rooms.

Any questions pertaining to hospital safety may be directed to the Executive Office. Answers will be included in this section in future issues.

Classified Advertisements

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NURSE ANESTHETIST to complete staff of three serving 130 bed hospital, fully approved by JCAH. Excellent salary; liberal personnel policies. Modern furnished apartment. Additional information on request. Pulaski Hospital, Pulaski, Virginia.

OPENING FOR NURSE ANESTHETIST: 212-bed hospital, town of 65,000, with large Air Force Base and Marine Corps Center adjacent; resort area, city only 90 miles from gulf; liberal salary, personnel policies, limited call duties. Apply: Administrator, Phoebe Putney Memorial Hospital, Albany, Georgia.

REFRESHER COURSE for Nurse Anesthetists. All agents, drugs and technics used. Duration of course from three to six months depending on need of individual. For information write: Virginia L. DeMaio, C.R.N.A., Director, School of Anesthesia, The Memorial Hospital, Danville, Virginia.

ANESTHETISTS: Immediate openings in a chain of ten General Hospitals located in the coal mining communities of Eastern Kentucky, Southwestern Virginia, and Southern West Virginia. Salary at the rate of $5880 or $7080 per annum, depending upon background and experience, annual increments, 4 weeks paid vacation, 7 paid holidays, sick leave, non-contributory retirement plan plus Social Security. Write to: MINERS MEMORIAL HOSPITAL ASSOCIATION, Box No. 61, Williamson, W. Va.

WANTED: Nurse Anesthetists; member A.A.N.A. to be second on staff of 99 bed County Hospital located in California's Central Valley; halfway between Los Angeles and San Francisco; also, near national parks. Salary starting at $464.00 per month on step raise ranges. Room available at nurses' residence. Heidbrink gas machine used. Good retirement plan and Social Security; health plan (Blue Cross). Write: Dr. Elmo R. Zumwalt, Medical Administrator, Tulare County General Hospital, Tulare, California.

NURSE ANESTHETIST, Male or Female, for hospital on Staten Island, N. Y., excellent conditions. Write: Box B-44, Journal American Association of Nurse Anesthetists, Prudential Plaza, Suite 3010, Chicago 1, Ill.

NURSE ANESTHETIST: 364 bed General Hospital being enlarged to 500 beds. Want to enlarge present staff of one M.D. plus 7 Anesthetists. Salary from $400 to $500 month plus extra bonus payment per case on call duty and retirement and sickness benefits. New air conditioned Operating Rooms. Apply Chief, Department of Anesthesia, York Hospital, York, Pa.

NURSE ANESTHETIST — 500 bed hospital. Anesthesia Department consists of three M.D. and thirteen Nurse Anesthetists. Write to Medical Director, Crawford W. Long Hospital, Atlanta, Georgia.

NURSE ANESTHETIST: Position available January 1961. 154 bed general hospital. Relief anesthetist is employed. Beginning salary $5482 plus bonus of ten weeks pay end of two year contract. Round trip transportation furnished, sick leave, paid holidays, free medical and dental care, opportunity for foreign travel. Apply Personnel Officer, Government of American Samoa, Pago Pago, American Samoa.

NURSE ANESTHETIST to complete staff of five for 268 adult bed hospital, expanding to 500 soon, located near Business District, Akron, Ohio. Surgery and OB. No call except relief. Forty hour week, extra for overtime. Four weeks vacation after year. Qualifications and experience govern salary offer. Apply: Administrator, St. Thomas Hospital, 444 N. Main St., Akron 10, Ohio.

REGISTERED NURSE ANESTHETISTS: 690 bed hospital, primarily surgical. Integral part of developing 236 acre Detroit Medical Center. Emergency surgery only on Saturdays. Salary commensurate with qualifications. Excellent personnel policies. Write or call Personnel Director, Harper Hospital, Detroit 1, Michigan.

NURSE ANESTHETISTS (2) needed for new 150 bed accredited General Hospital, 25 miles west of Detroit, Michigan. Starting salary $500.00 per month for forty (40) hour week. Full coverage for both surgical and obstetrical departments. Remuneration for surgical call. Doctors are excellent to work with. D. Kehler, Chief Anesthetist, Annapolis Hospital, Wayne, Michigan.

NURSE ANESTHETISTS: Male or Female using all anesthesia agents for all types of surgery including neuro and chest. Department does total of approximately 800 cases per month. 10 full time anesthetists on staff. No night duty but rotate afternoon shift. School has 12 students. 705 bed hospital in community of 200,000. Starting salary $6929. Contact either Miss Marie Brown, Director of Department and School of Anesthesia or Robert E. White, Director of Employee and Public Relations. Hurley Hospital, Flint 2, Michigan.

WANTED: NURSE ANESTHETIST to join staff of four Physicians and three Nurse Anesthetists in lower Connecticut. Prevailing Connecticut salary — liberal vacation and sick leave. Reply Box B-50, Journal American Association of Nurse Anesthetists, Prudential Plaza, Suite 3010, Chicago 1, Ill.

NURSE ANESTHETIST—$500. New and Modern Surgery: unusually strong and well diversified Surgical Staff. Good opportunity in new 260-bed expanding hospital; college town location; good personnel policies; 40-hour week; 7 holidays, hospitalization. Social Security. Apply: F. J. O'Brien, Administrator, Chambersburg Hospital, Chambersburg, Pa.

OPENING for Registered Nurse Anesthetist. University City, population 100,000. New 175 bed hospital, 2 M.D. Anesthesiologists and 4 R.N.A.'s now in department. Day off after call. Sick leave, 2 weeks vacation to start. Retirement plan and other benefits. Congenial working conditions. Begin $500.00 per month. Contact Dr. Francis or Dr. McGowan, Central Baptist Hospital, Lexington, Ky.

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POSITIONS OPEN for A.A.N.A. member to increase to staff of five. Large University Hospital, excellent staff with wide variety of surgical cases, including Thoracic Surgery. Two weeks paid vacation, cumulative sick leave and six paid holidays. Other fringe benefits if desired. Starting salary with compensation for call duty averages $570-$600.00. Five day week. Contact Miss Ramona Kersey, Chief Nurse Anesthetist, Firmin Desloge Hospital, St. Louis 4, Mo.

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NURSE ANESTHETIST FOR ACTIVE OBSTETRICAL DEPARTMENT, 500 bed General Hospital, night duty, no on-call or weekend duty, 40 hour week, salary open, modern Personnel Policies. Apply: Assistant Director, Aultman Hospital, Canton, Ohio.

NURSE ANESTHETIST — 165 bed fully accredited General Hospital, pleasant working conditions, 4 weeks vacation after 1 year service, starting salary $525.00 per month, scheduled raises, living quarters available, other benefits. Apply: Personnel Director, Englewood Hospital, 6001 S. Green St., Chicago 21, Ill.

WANTED — Registered Nurse Anesthetist. 120 bed General Hospital, accredited by J.C.A.H. Near Pa. Turnpike. 60 miles East of Pittsburgh, 2½ hours to Harrisburg, 4½ hours to Philadelphia. Excellent recreational facilities Winter and Summer. Apply to Administrator, Somerset Community Hospital, 225 S. Center Ave., Somerset, Pennsylvania.

NURSE ANESTHETISTS to complete staff of three for 85 adult bed hospital. Situated midway on Pennsylvania Turnpike between Pittsburgh and Harrisburg. Famous Resort Area. Salary open, liberal Personnel Policies. Apply Miss M. Valigorsky, C.R.N.A., Memorial Hospital of Bedford County or telephone Collect — Bedford 655. Route 1, Everett, Pa.

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WANTED: Nurse Anesthetists in a 370 bed church owned hospital soon to double in size. Affiliated with The Baylor University College of Medicine. Starting salary $475.00. After 90 days salary will be raised to $500.00 with a $10.00 raise every 6 months. On call once weekly, long weekend every 6-7 weeks. Average 40 hour work week. Apply: Director of Personnel, The Methodist Hospital, Texas Medical Center, Houston 25, Texas.

NURSE ANESTHETIST, 52 bed General Hospital, coverage on 24 hour basis for Surgery and OB. New 65 bed hospital to be completed in 2½ years. Two week vacation, sick leave, attractive working conditions. Starting salary $650.00 to $700.00 per month depending on applicant's experience. Interested persons contact L. D. Feeback, Administrator, Warrensburg Medical Center, Inc., Warrensburg, Missouri.

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NURSE ANESTHETIST: for accredited 400 bed General Hospital. 40 hr. week. Minimum call. Top salary. Liberal vacation, sick leave, other benefits. Quarters, laundry and maintenance available. Call or write Personnel Dir., Miller Hospital, St. Paul, Minn.

WANTED: 2 NURSE ANESTHETISTS to join staff of 5 M.D.'s and one RNA at 360 bed hospital. No OB—no emergency or night call. Hospital in Trenton, N. J. — within one hour of New York, Philadelphia, and Seashore. Prevailing salaries. Reply to Assoc. Anesthesiologists, 609 Greenwood Ave., Trenton, N. J.

WANTED—Nurse Anesthetist to work with established group of Anesthesiologists and Nurse Anesthetists in 250 bed hospital. Surgical Anesthesia only. Salary $475 - $500 with increase in six months. Available at once. Write — L. Garr Merrill, M.D., St. Benedict's Hospital, Ogden, Utah.

WANTED: Nurse Anesthetist for a 45 bed active County Hospital, Page County, Virginia. Salary open. Write Dr. Walter E. Schlabach, 14 S. Court St., Luray, Va., or Page County Memorial Hospital.

WANTED — Young Female Nurse Anesthetist for expanding hospital North of Boston. New O.R.'s and Obs. unit. Poise and personality a factor as well as adequate training. Close to mountains, beach and resort area. Harold S. Wright, M.D., Chief of Anesthesia, Hale Hospital, Haverhill, Mass.

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WANTED—Nurse Anesthetist for 146 bed hospital. Attractive community. Active General Hospital, excellent equipment to work with. Salary open. Apply Administrator, Warren General Hospital, Warren, Pa.

WANTED: Nurse Anesthetist, Gulf Coast resort area, work with four Anesthesiologists. Salary $500 up, depending upon ability. Call collect: Vernon N. Balovich, M.D., (HE 2-5487), 160-A Louiselle St., Mobile, Ala.

NURSE ANESTHETIST. Modern Hospital. Excellent working conditions. Liberal Personnel Policies. Schedule usually completed by noon. Starting salary, with experience — $575. Apply to C. A. Okey, Administrator, Weirton General Hospital, Weirton, W. Va.

YOU WILL LIKE US — Here you will find friendliness among your colleagues and a cooperative atmosphere among both Medical Staff and Administration in a beautifully equipped, new 208 bed general service hospital. This is a pleasant resort area in historic, yet modern, Tidewater Virginia. Offer us your skill, interest, and dependability; we offer you, in addition to an excellent salary, pleasant and permanent employment, "on call" pay, sick leave, paid holidays and vacations, and your meals free while "on call". Write or call Administrator, Dixie Hospital, Hampton, Va.

POSITION WANTED: A married Male, C.R.N.A., desires a position with a fee for service basis. Reply: Box B-59, Journal American Association of Nurse Anesthetists, Prudential Plaza, Suite 3010, Chicago 1, Ill.

NURSE ANESTHETIST. Registered Nurse with experience in Supervision and Anesthesiology, to work as Anesthetist, relieving Director of Nurses, assisting with training program for Nurses Aids. Salary range (5 steps) $464.00 to $581.00 per month. Starting salary $519.00 if experienced in Anesthesiology. Modern, well equipped hospital in rural area. 15 working days vacation annually, sick leave, retirement system, including Social Security. Living accommodations for single person at nominal charge. Contact William A. Winn, M.D., Medical Director, Tulare-Kings Counties Hospital, Springville, Calif.

WANTED: 2 Nurse Anesthetists. 50 bed hospital 50 miles North of Atlanta. Salary open. If interested contact Administrator, Tanner Memorial Hospital, Carrollton, Ga.

POSITION WANTED: Married Male Nurse Anesthetist, A.A.N.A. Member, desires to locate in Midwest. Three years experience using all agents. Percentage or fee basis. Write to Box B-60, Journal American Association of Nurse Anesthetists, Prudential Plaza, Suite 3010, Chicago 1, Ill.

NURSE ANESTHETIST: One hundred fifty-five bed General Hospital. Forty hour week. Air conditioned Operating Rooms. Liberal sick leave. Vacation. Salary $600.00. Apply: G. L. Crutchfield, Administrator, Ouachita County Hospital, Camden, Ark.

NURSE ANESTHETIST: 264 bed, air conditioned General Hospital. Salary from $475, according to experience. 40 hour week with liberal sick leave, vacation, retirement, and hospitalization benefits. Staff now consists of 7 Nurse Anesthetists and 2 M.D. Anesthetists. Write: James W. Lassiter, M.D., Chief of Anesthesia, Brackenridge Hospital, Austin, Tex.

NURSE ANESTHETIST: Permanent position. Immediate opening in Teaching Hospital. Liberal Personnel Policies. Apply: Chief Anesthetist, Meharry Medical College, Nashville, Tennessee.

WANTED: Well qualified Nurse Anesthetist, salary open. Contact Administrator, Beaufort Memorial Hospital, Beaufort, S. C.

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- Notes on Chemistry and Physics

Order from: A.A.N.A., Suite 3010, Prudential Plaza, Chicago 1, Ill.

The THIRTY-THIRD QUALIFYING EXAMINATION for membership in the American Association of Nurse Anesthetists will be conducted on May 13, 1961. The deadline for accepting completed applications including the transcripts is April 1. Notice of eligibility will be mailed about April 10.

Applications should be forwarded early enough to allow time to request transcripts and have them returned to the Executive Office before the deadline date.

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BEER

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avoid postoperative difficulties—do not hesitate to request postoperative bronchoscopy whenever you are in doubt whether the tracheobronchial tree has been adequately cleared by catheter suction.

Replace blood as it is lost, but remember that in pneumonectomy, at least, overloading of the pulmonary circulation is a very real danger that has to be avoided by very slow transfusion of an amount just adequate to maintain the circulating volume.

I have tried to present to you the most important problems that make surgery and anesthesia in the open chest unique. I have tried to impress upon you the importance of maintaining the vital functions within safe limits, regardless of drugs or methods employed. In thoracic surgery no less than in general surgery, the anesthesia should fit the patient's needs first of all, and our individual success or failure in our chosen field will greatly depend upon our success in being able and capable to follow this principle.

HOSPITAL SAFETY

(Continued from page 366)

If the hospital is built in several different wings, it is possible that a different section of the hospital itself could be used. In other circumstances separate buildings, even neighboring houses, may have to be used.

Professional fire fighters and civil defense authorities feel that all responsible hospital employees should think about these things. Excepting war-time experiences, has an operating team ever temporarily halted surgery, moved the patient and equipment to a different location and completed surgery? If so, please send an account of such incident to this column in care of A.A.N.A. headquarters.

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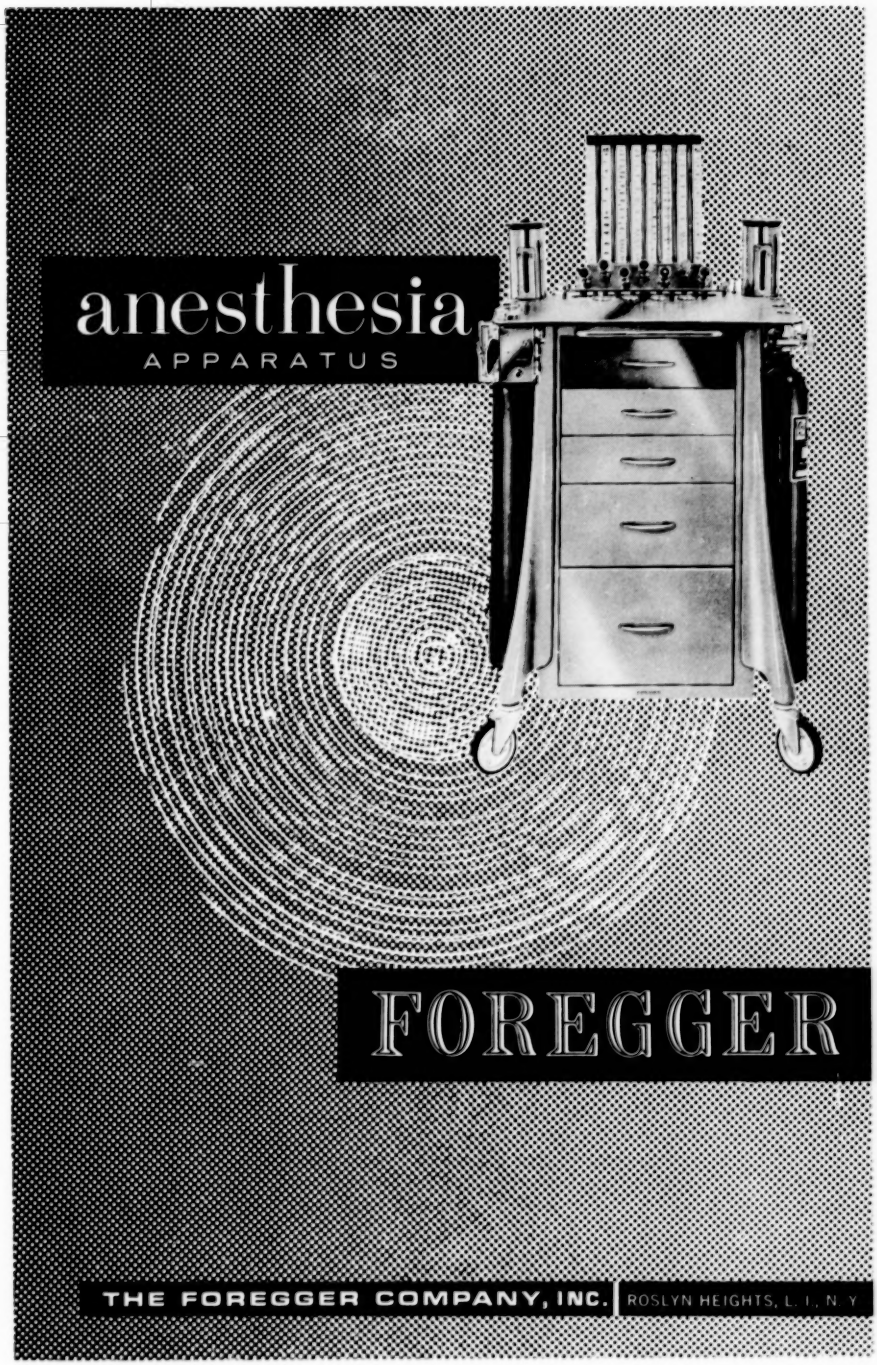
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